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On the Boston Fish Pier

Marine Fisheries REVIEW

On the cover: Scenes from the Boston Fish Pier.

Articles — *January 1983, 45(1)*

Groundfish Processing in Massachusetts During the 1970's — *Daniel Georgianna* and *Richard Ibara* 1

An Estimate of Harvest by the Texas Charter Boat Fishery — *Lawrence W. McEachron* and *Gary C. Matlock* 11

Departments

NOAA/NMFS Developments — *Hawaiian Seafood Utilization and Exports, U.S.-R.O.K. Fishery Agreement, Scallop Imports Seized, Salmon Inspection, Thawing Fish Properly for Processing, Tortugas Shrimp Catches,* and *A Special TOP Notice* 18

Foreign Fishery Developments — *Japanese Joint Fishing Ventures Stabilize, Latin American Tuna and Hake Exports and Fish Imports, Japan's Aquaculture Production and Fish Quality Assurance,* and *African and Middle Eastern Fishery Officials* 20

Fishery Notes — *New York and Virginia Fish Ladders, Alaskan Abalones and Salmon, The Pacific Halibut Catch, Florida's Marine Angling Value,* and *Oregon's Rockfish Landings* 27

Publications — *Northeast Fisheries Center Technical Memoranda, Sciaenids and Marine Recreational Fishing, Cephalopod Resources and Their Harvest,* and *The Environment Near Shore* 29

In Brief . . . . — *Marine Anglers, Angling Records,* and *Striped Bass Poachers* 32

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Groundfish Processing in Massachusetts During the 1970's

DANIEL GEORGIANNA and RICHARD IBARA

Introduction

Groundfish products, flounders, Atlantic cod (hereafter referred to as cod), haddock, pollock, and ocean perch, play a major role in the U.S. fresh fish industry. In 1979, fresh and frozen groundfish fillets accounted for 68 percent of the quantity and 76 percent of wholesale value for the fresh and frozen fillets from all species (USDC, 1980).

Most U.S. groundfish processing (72 percent by both quantity and wholesale value of fillets) is done in Massachusetts. In 1979, processing plants there produced 85 million pounds of the U.S. fresh and frozen groundfish fillet total of 119 million pounds and $133 million of the total wholesale value of $186 million[1]. Knowledge of Massachusetts' groundfish industry is obviously important in choosing management alternatives as required by the Fishery Conservation and Management Act of 1976 (FCMA).

Fresh groundfish production in Massachusetts is a result of three separate but interconnected industries: Fishing, processing, and retailing. In 1979, about 450 boats (in excess of 5 tons gross weight) landed and sold their catch to processing firms and brokers at the various ports in Massachusetts[2]. Since most of these boats are owned by fishing families or are partnerships among the captain and various crew members, the sales of fresh groundfish by boats to processing firms are transactions between independent companies. Ex-vessel prices are determined either through auctions (as in Boston and New Bedford), individual negotiations, or consignment sales. Round or drawn fish arrive at the processing plants and are usually filleted, skinned, and packaged into 10- or 20-pound containers. Other products include steaks, frozen fillets, frozen blocks, and frozen and packaged dinners and portions.

The final and most crucial part of fresh fish processing is sales. The rapid deterioriation of fresh fish and the large variation in both supply and demand contribute to a constant crisis atmosphere in the sales departments of processing companies. As in most businesses, sales is the major determinant of production rates. Processing firms to sell to fish markets, supermarkets, restaurants, and institutions which, in turn, sell these groundfish products to final consumers. Except for cooking and other preparation in restaurants and institutions, retail products are sold in the same form as received from processing plants.

[1]Massachusetts total from Georgianna, D., and J. Dirlam, 1981. A statistical summary of the groundfish processing industry in Massachusetts. Prog. rep., NMFS, Gloucester, Mass. U.S. Totals are from USDC, 1980.

[2]Pat Kurkul, Industry Economist, National Marine Fisheries Service, NOAA, Gloucester, MA 01930. Pers. commun.

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ABSTRACT—Massachusetts groundfish (flounders, Atlantic cod, haddock, pollock, and ocean perch) landings, production, and Canadian imports were compiled from 1970 to 1979. Generally, the first half of the 1970's was a period of stagnation for the Massachusetts groundfish industry. Its revitalization roughly corresponded with the passage of the Fishery Conservation and Management Act of 1976. From 1976 through 1979, landings, production, and wholesale value of processed products increased by 44 percent, 50 percent, and 62 percent, respectively. Furthermore, wholesale prices increased steadily from a weighted average of $0.60/pound in 1970 to $1.56/pound in 1979, 50 percent more than the increase in the average wholesale price of meat, poultry, and fish.

Boston's and New Bedford's shares of Massachusetts' landings dropped about 30 percent with the difference being made up by Gloucester and the smaller ports. However, both Boston and New Bedford retained their share of processed production. With the large decline of yellowtail landings starting in the 1960's and extending into the 1970's, New Bedford, traditionally the leading port for this species, became a major port for cod and haddock as the fleet and processing plants switched to these species.

The FCMA, which was enacted with considerable support from the New England fishing industry, added a political dimension to the financial interdependence among the sectors in the groundfish industry. The Act established a 200-mile offshore conservation zone and created Regional Fishery Management Councils to plan for the optimum utilization by the nation of traditional commercial species and to encourage the commercial development of nontraditional species. The New England Fishery Management Council has concentrated on conservation by means of quotas for the traditional species. Subsidies and gear development programs have been introduced to encourage landings of nontraditional species.

Quotas, when applied, have usually affected the ports in Massachusetts differently, since Massachusetts' ports have traditionally specialized by species: Boston has harvested and processed primarily cod, haddock, and pollock; New Bedford, flounders; and Gloucester, ocean perch (White, 1954; Smith and Peterson, 1977). The ports have tended to land the species they process, but there has been considerable movement of drawn and round fish among ports both within and outside of the Commonwealth. Therefore, the processing industry at each port has been more complex than is reflected by local landings.

In estimating capacity, industrial organization, and cost structure of the New England processing industry, we compiled basic data on the landings, production, and movement of fresh fish and decided to develop this statistical description of the Massachusetts fresh groundfish industry[3]. A general overview of the pattern of fish landings, processing, and processing employment among the ports is not only useful in computing production and predicting changes in processing capacity but can also indicate economic effects on various ports and the reaction of the processing industry to changes in quotas and landings.

Information presented in this paper includes annual landings, annual processed production by the major ports and by species, employment and average plant size by port, and movement of unprocessed fish into and out of the state. These data are presented for 1970-79, except for landings (1964-79), and Canadian imports (1974-79).

Methods

Data sources were the National Marine Fisheries Service (NMFS) Resource Statistics Division, Washington, D.C.; NMFS Northeast Fisheries Center, Woods Hole, Mass.; and NMFS Market News (New York and Boston). The data were obtained either from direct access or on magnetic tape or transcribed from computer printouts and published sheets. Unfortunately, NMFS did not retain processing production data prior to 1970, and Canadian import data for whole fresh groundfish by species were not available for the years prior to 1974.

Groundfish landings were compiled as landed weight (whole fish weight for flounders and ocean perch and drawn weight for cod, haddock, and pollock). Yearly rates of production have been presented as either product weight or converted to landed weight by multiplying by the conversion factors 2.63, 2.50, 2.19, 2.82, and 3.57 for cod, haddock, pollock, flounder, and ocean perch, respectively[4].

Yearly rates of production and yearly value were estimated by totaling the rates and values by species for all plants that used fresh groundfish inputs. Since the NMFS data did not categorize by type of input, we determined the use of fresh or frozen inputs within a plant by interviewing plant managers, NMFS port agents, and NMFS Market News reporters.

Groundfish plants in Massachusetts usually processed from either fresh or frozen inputs, but rarely from both types. We estimated that there were fewer than five plants that used both types of inputs in Massachusetts, and these plants were included in the totals if they used mostly fresh inputs. Since employment is not reported by type of input, employment estimates were likewise totaled from fresh groundfish plants.

We also estimated flows of unprocessed fish into and out of Massachusetts. Groundfish came into Massachusetts primarily from Canada, Maine, and Newport, R.I. To estimate this input, we assumed that all fresh, whole, or drawn Canadian groundfish that passed through the New England Customs Districts were processed in Massachusetts. The amount of Maine groundfish landings shipped to Massachusetts was estimated as the remainder after subtracting Maine's fresh and frozen fillet production and whole fish trucked to the Fulton Fish Market in New York from Maine landings. New Bedford fish dealers and fishermen informed us that all cod, haddock, and pollock landed in Newport was trucked to Massachusetts for further processing. However, since some of the flounder landed in Newport went to the Fulton Fish Market, we assumed that Newport dealers transported to New York the same percentage of flounder as did Massachusetts dealers, roughly 20 percent. The remainder, we assumed, came into Massachusetts.

Whole and drawn fish shipped out of state went primarily to the Fulton Fish Market and was recorded there by state of origin. Data for fish trucked to other states from Massachusetts were not systematically recorded, nor were data kept for fish coming into Massachusetts from the southern coastal states[5].

[3]Georgianna, D., P. Greenwood, R. Ibara, and R. Ward. 1981. Fish processing capacity in Massachusetts and New Hampshire. Tech. rep. New England Fisheries Development Program, National Marine Fisheries Service, NOAA, Gloucester, MA 01930.

[4]Main, D. E., Port Agent, Resource Statistics Division, NMFS, New Bedford, MA 02740. Pers. commun.

[5]For further details on the method of estimating fish movement, see D. Georgianna et al., Fish processing capacity in Massachusetts and New Hampshire. Tech. rep., New England Fisheries Development Program, National Marine Fisheries Service, NOAA, Gloucester, MA 01930.

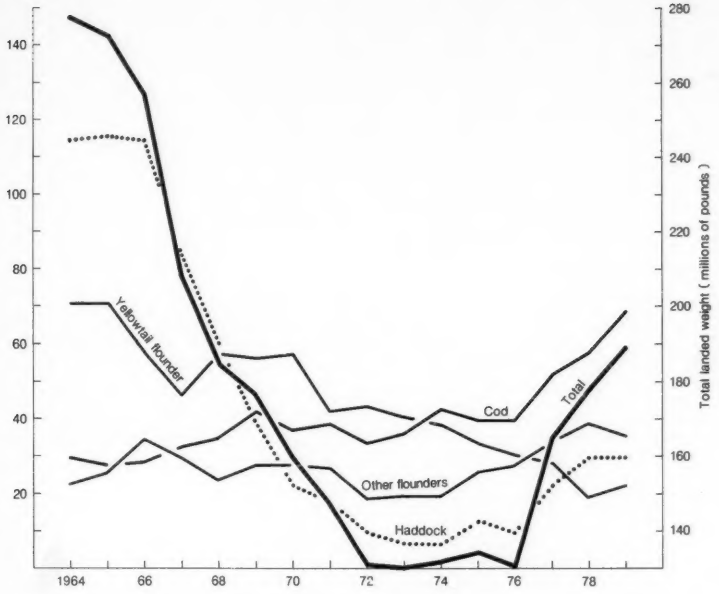

Figure 1.—Massachusetts landings of yellowtail flounder, other flounder species, cod, haddock, and total (including pollock and ocean perch, scale on right), 1964-79.

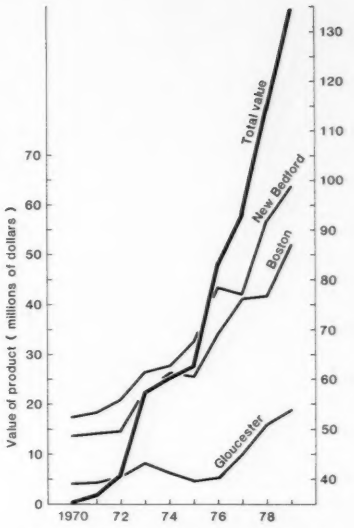

Figure 2.—Comparison of values of fresh groundfish production among the ports and the total Massachusetts value (scale on right) for the 1970's.

Results

Significant changes in groundfish landings occurred between 1964 and 1979. From a high of 279 million pounds in 1964, landings decreased by 53 percent to a low of 130 million pounds in 1973 (Fig. 1). The trend in recent years has reversed with landings in 1979 recovering to 68 percent of 1964's landings primarily due to increased abundance and the growth of the New England fishing fleet since passage of the FCMA.

In terms of species, total flounder landings in 1979 were down by 36 million pounds from 1964, a 38 percent drop[6]. Yellowtail decreased fairly steadily after 1964, from 71 million pounds to 23 million pounds in 1979, without any indication of recovery. However, landings of other species of flounder increased from 23 million pounds in 1964 to 36 million pounds in 1979. Total cod, haddock, and pollock (data not shown in Fig. 1) landings were 155 million pounds in 1964, dropped to 66 million pounds by 1970, and recovered to 115 million pounds by 1979. Cod landings increased steadily from 30 to 68 million pounds, a 230 percent increase from 1964 to 1979. The drop in haddock landings from 114 million pounds in 1964 to 7 million pounds in 1974 was sharp. Haddock landings have increased since 1974 but the 1979 landings of 29 million pounds were only 26 percent of the 1964 landings. Pollock landings (data not presented in Fig. 1), historically the least important of these three species, increased during the period to 17 million pounds in 1979 from 11 million pounds in 1964 and varied from 5 million pounds in 1968 to 19 million pounds in 1978. The pattern of ocean perch landings (data not shown in Fig. 1) was similar to that for haddock with a drop of about 88 percent during the 1960's, from 30 to 4 million pounds from 1964 to 1968, respectively. A partial recovery occurred during the 1970's to 16 million pounds by 1979.

The yearly Massachusetts' landings, rate, and value of production for combined groundfish species increased during the 1970's. Groundfish landings increased by 29 million pounds, an increase of 18 percent (Table 1, Fig. 1). Rate of production increased by 28 million pounds in product weight, an increase of 47 percent. The value of processed products increased by $99 million, a 281 percent increase (Table 1, Fig. 2).

[6]Landings not shown on Figure 1 are from the NMFS Northeast Fisheries Center, Woods Hole, Mass., and are available from the senior author.

Table 1.—Groundfish landings, production, and product value by port[1] (landed and product weight in millions of pounds; wholesale processed value in millions of dollars).

Year	Item	Boston	Gloucester	New Bedford	Other[2]	Total
1970	Landed	30.8 (19%)	30.9 (19%)	81.9 (51%)	16.0 (10%)	159.6
	Processed	22.6 (39%)	8.6 (15%)	27.2 (46%)		58.4
	Value	$13.6	$ 4.2	$17.5		$ 35.3
1971	Landed	30.0 (20%)	34.1 (23%)	58.7 (40%)	24.2 (16%)	147.0
	Processed	20.0 (38%)	8.8 (16%)	24.5 (46%)		53.3
	Value	$14.2	$ 4.3	$18.3		$ 36.8
1972	Landed	19.4 (15%)	36.0 (28%)	52.7 (40%)	22.4 (17%)	130.5
	Processed	15.8 (32%)	9.2 (19%)	24.2 (49%)		49.2
	Value	$14.6	$ 5.5	$20.8		$ 40.9
1973	Landed	22.5 (17%)	33.0 (26%)	50.5 (39%)	23.9 (18%)	129.9
	Processed	24.3 (39%)	11.9 (19%)	25.9 (42%)		62.1
	Value	$22.6	$ 8.1	$26.5		$ 57.2
1974	Landed	23.5 (18%)	28.7 (22%)	53.5 (41%)	25.5 (19%)	131.2
	Processed	24.9 (42%)	9.3 (16%)	25.1 (42%)		59.3
	Value	$26.1	$ 6.3	$27.7		$ 60.1
1975	Landed	20.9 (15%)	34.6 (26%)	57.4 (43%)	21.3 (16%)	134.2
	Processed	21.5 (42%)	5.6 (11%)	23.8 (47%)		50.9
	Value	$25.5	$ 4.7	$32.5		$ 62.7
1976	Landed	19.7 (15%)	38.7 (30%)	50.4 (38%)	22.1 (17%)	130.9
	Processed	26.2 (46%)	4.8 (8%)	26.2 (46%)		57.2
	Value	$34.3	$ 5.3	$43.5		$ 83.1
1977	Landed	19.0 (12%)	59.6 (36%)	57.1 (35%)	28.5 (17%)	164.2
	Processed	32.0 (47%)	9.7 (14%)	26.6 (39%)		68.3
	Value	$41.1	$10.0	$42.1		$ 93.2
1978	Landed	23.1 (13%)	65.7 (37%)	52.6 (30%)	35.9 (20%)	177.3
	Processed	28.6 (37%)	14.8 (19%)	33.2 (43%)		76.6
	Value	$41.8	$15.9	$56.8		$114.5
1979	Landed	25.9 (13%)	61.6 (33%)	63.8 (34%)	37.5 (20%)	188.8
	Processed	33.6 (39%)	14.0 (16%)	38.3 (45%)		85.9
	Value	$51.8	$18.8	$63.8		$134.4

[1]Compiled from data supplied by the Northeast Fisheries Center, NMFS, NOAA, Woods Hole, Mass., and the Resource Statistics Division, NMFS, NOAA, Washington, D.C.

[2]Processed products of "Other" ports were included in the nearest major port.

Since product weight averages around 30 percent of landed weight, it can be seen that production increased at a faster rate than landings (Fig. 3). Large shipments of unprocessed groundfish were coming into Massachusetts from Canada, Maine, Rhode Island, and other southern coastal states.

Among the ports, Boston's share of landings dropped from 19 to 13 percent while its share of processed production remained relatively constant around 40 percent (Table 1, Fig. 4). The pattern in New Bedford was similar with its share of landings dropping from 51 to 34 percent while its share of processed production remained about 45 percent. Gloucester's share of landings increased from 19 to 33 percent while its share of processed production remained at about 15 percent. During the 1970's, the smaller ports produced an insignificant amount of processed products, but their share of landings increased from 10 to 20 percent.

While the shares of total processed groundfish products among ports remained constant, the species composi-

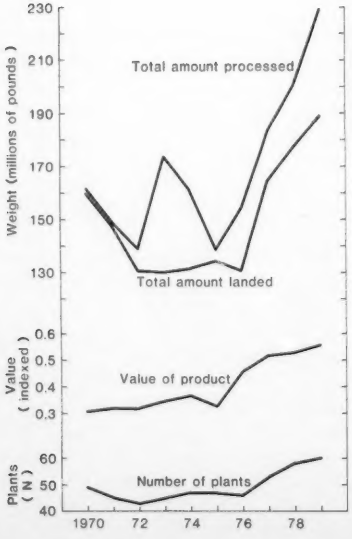

Figure 3.—Comparison of Massachusetts groundfish landings (Total amount landed), processed production (Total amount processed, converted to landed weight), value of production (Value of product, indexed by wholesale price of processed meats, poultry, and fish), and number of processing plants (Number of plants) for the 1970's.

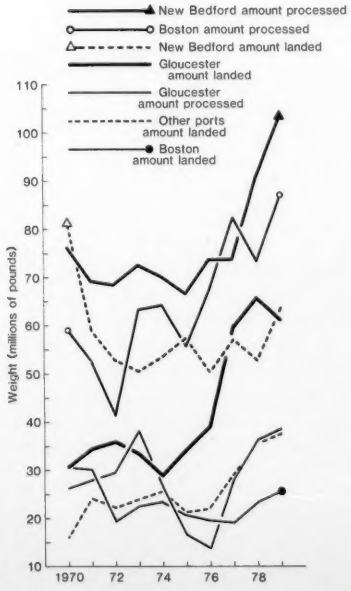

Figure 4.—Comparison of groundfish landings (Amount landed) among the three major ports and the "other" ports, and groundfish production (Amount processed, converted to landed weight) among the ports for the 1970's.

tion of groundfish production by port changed significantly, reflecting the decreased ex-vessel supply of flounders and increased ex-vessel supply of cod, haddock, and pollock. Massachusetts' flounder landings decreased by 26.6 million pounds (313 percent), as processed production decreased by 7.4 million pounds (88 percent) and value increased by $32 million (165 percent) between 1970 and 1979 (Table 2). New Bedford suffered the bulk of the loss in flounder landings, a decrease of 43.3 million pounds (62 percent), while flounder landings increased in Gloucester and the smaller ports by 19 million pounds (170 percent). As a result, New Bedford's share of Massachusetts flounder landings decreased from 82 to 45 percent between 1970 and 1979.

The decrease in flounder landings and processed products was more than offset by the increase in the landing and processing of cod, haddock, and pollock, with New Bedford receiving the bulk of the cod and haddock increases. Cod landings increased by 31 million pounds (83 percent), production by 46 million pounds (154 percent), and value by $33 million (566 percent) between 1970 and 1979 (Table 3). Boston processed 65 percent of the cod in 1970 while New Bedford processed only 24 percent. But, by 1979, Boston had dropped to 46 percent of Massachusetts' totals while New Bedford had increased its share to 40 percent. Gloucester maintained a relatively constant proportion of production, approximately 12 percent, throughout the 1970's.

Haddock landings increased by 7 million pounds (33 percent), production by 22 million pounds (95 percent), and value by $24 million (329 percent) between 1970 and 1979 (Table 4). In the early 1970's, Boston landed approximately half and processed about 85 percent of the fresh haddock in Massachusetts. By 1979, Boston's share of haddock landings dropped to 22 percent and production dropped to 55 percent. The drop in Boston's share was accompanied by increases in New Bedford's and Gloucester's shares. In the early 1970's, New Bedford landed about 20 percent of Massachusetts' haddock landings and processed less than 1 million pounds, 3 percent of Massachusetts' production. By 1979, however, New Bedford landed 10 million pounds, 34 percent of Massachusetts' haddock landings and processed 12 million pounds, 26 percent of Massachusetts' production. Gloucester increased its share of haddock landings from 24 percent to 38 percent and production from 13 percent to 19 percent between 1970 and 1979.

Pollock landings and production increased by 10 million pounds (139 and 125 percent, respectively), while wholesale value increased by $6 million (500 percent) between 1970 and 1979 (Table 5). Boston dominated production throughout the 1970's, producing from 66 to 88 percent of Massachusetts' fresh pollock. However, Boston's share of landings decreased from about 50 to 20 percent while Gloucester and New Bedford increased their share of landings to 59 and 11 percent, respectively, between 1970 and 1979.

Ocean perch landings increased by 8 million pounds (87 percent), production decreased by 2 million pounds (12 percent), and value increased by $4 million (211 percent) (Table 6). In 1970, Gloucester landed 87 percent and processed 73 percent of Massachusetts' totals for ocean perch. By 1979, its share of landings and production dropped to 60 and 64 percent, respectively, losing some of the market to Boston.

In general, more unprocessed fish came into Massachusetts than went out, and the excess of incoming fish, except for ocean perch, increased with time (Table 7). Even though landings

Table 2.—Flounder landings, production, and product value by port[1] (landed and product weight (converted to landed weight) in millions of pounds and wholesale processed value in millions of dollars).

Year	Item	Boston	Gloucester	New Bedford	Other[2]	Total
1970	Landed	3.8 (4%)	4.5 (5%)	69.7 (82%)	6.9 (8%)	84.9
	Processed	9.0 (11%)	6.2 (7%)	68.5 (82%)		83.7
	Value	$ 2.3	$ 1.4	$15.7		$ 19.4
1971	Landed	4.4 (6%)	4.2 (6%)	46.7 (68%)	13.5 (20%)	68.8
	Processed	8.5 (12%)	4.2 (6%)	61.2 (82%)		73.9
	Value	$ 2.5	$ 0.9	$16.3		$ 19.7
1972	Landed	2.2 (4%)	3.0 (5%)	44.3 (72%)	12.2 (19%)	61.7
	Processed	7.3 (10%)	2.3 (3%)	63.4 (87%)		73.0
	Value	$ 2.4	$ 0.6	$19.3		$ 22.3
1973	Landed	3.1 (5%)	3.8 (6%)	39.7 (67%)	12.8 (22%)	59.4
	Processed	8.5 (10%)	8.2 (10%)	65.1 (80%)		81.8
	Value	$ 3.3	$ 2.3	$24.1		$ 29.7
1974	Landed	2.7 (5%)	3.0 (5%)	39.4 (68%)	13.0 (22%)	58.1
	Processed	6.2 (9%)	2.8 (4%)	58.4 (87%)		67.4
	Value	$ 2.8	$ 1.2	$23.5		$ 27.5
1975	Landed	1.7 (3%)	4.4 (7%)	42.4 (72%)	10.5 (18%)	59.0
	Processed	6.5 (10%)	1.4 (2%)	59.5 (88%)		67.4
	Value	$ 3.9	$ 0.5	$29.4		$ 33.8
1976	Landed	1.5 (3%)	6.9 (12%)	35.5 (62%)	13.5 (23%)	57.4
	Processed	7.9 (11%)	1.1 (1%)	65.7 (88%)		74.7
	Value	$ 4.6	$ 0.6	$39.7		$ 44.9
1977	Landed	1.2 (2%)	11.2 (18%)	32.9 (53%)	16.7 (27%)	62.0
	Processed	8.7 (13%)	4.8 (7%)	53.6 (80%)		67.1
	Value	$ 6.1	$ 2.1	$33.0		$ 41.2
1978	Landed	1.6 (3%)	13.9 (24%)	24.9 (42%)	18.1 (31%)	58.5
	Processed	7.9 (11%)	5.1 (7%)	56.6 (82%)		69.6
	Value	$ 7.0	$ 2.3	$39.5		$ 48.8
1979	Landed	1.6 (3%)	11.8 (20%)	26.4 (45%)	18.5 (32%)	58.3
	Processed	10.7 (14%)	5.1 (7%)	60.6 (79%)		76.4
	Value	$ 8.0	$ 2.8	$40.6		$ 51.4

[1]Compiled from data supplied by the Northeast Fisheries Center, NMFS, NOAA, Woods Hole, Mass., and the Resource Statistics Division, NMFS, NOAA, Washington, D.C.

[2]Processed products of "Other" ports were included in the nearest major port.

in Massachusetts increased by 44 percent between 1974 and 1979, the demand for fresh fish inputs increased by even more as the net imports into Massachusetts increased from 16.9 million pounds to 28.1 million pounds over the period.

The species brought unprocessed into Massachusetts in the largest quantities were flounders and haddock. In 1979, the net shipment into Massachusetts of whole flounders was 11 million pounds. According to processing plant managers, fishermen, New York Market News reporters, and port agents, most of the yellowtail flounder landed in New England were processed in New Bedford, while winter flounder and other flounders were trucked to New York. Unfortunately, neither the production data nor Canadian imports were recorded by species of flounder. Recently, from the landings and processing data, it seems likely that more winter flounder and other flounders were processed in New Bedford.

During the 1970's, virtually no unprocessed haddock left Massachusetts while large amounts of drawn haddock were brought into the Commonwealth. In 1974, more drawn haddock was brought into Massachusetts than was landed there, while in the late 1970's shipments into Massachusetts totaled about one-third of local landings.

According to our method of estimation, relatively large amounts of drawn pollock (4 to 6 million pounds) came into Massachusetts from Maine yearly from 1976 through 1979, even though the data indicate that Massachusetts landings alone roughly equaled processed production (Table 5). We cannot explain this difference. Unfortunately, there has been very little investigation into the production and distribution of pollock.

During most of the years between 1974 and 1979, more drawn cod was trucked to the Fulton Fish Market from Massachusetts than was brought into the Commonwealth from Maine, Canada, and Newport, R.I. The net outflow has decreased in recent years even though Massachusetts landings of cod have increased significantly, implying an increase in the demand for cod.

Table 3.—Atlantic cod landings, production, and product value by port[1] (landed and product weight (converted to landed weight) in millions of pounds and wholesale processed value in millions of dollars).

Year	Item	Boston	Gloucester	New Bedford	Other[2]	Total
1970	Landed	10.6 (28%)	10.6 (29%)	8.1 (22%)	7.8 (21%)	37.1
	Processed	19.2 (65%)	3.4 (11%)	7.1 (24%)		29.7
	Value	$ 3.6	$ 0.7	$ 1.6		$ 5.9
1971	Landed	11.0 (30%)	9.9 (26%)	8.3 (22%)	9.1 (24%)	38.3
	Processed	20.5 (68%)	2.9 (10%)	6.8 (22%)		30.2
	Value	$ 4.5	$ 0.7	$ 1.8		$ 7.0
1972	Landed	8.1 (24%)	10.0 (30%)	6.5 (20%)	8.6 (26%)	33.2
	Processed	14.5 (66%)	2.9 (13%)	4.5 (21%)		21.9
	Value	$ 4.3	$ 0.9	$ 1.3		$ 6.5
1973	Landed	9.7 (27%)	8.3 (23%)	8.9 (25%)	9.0 (25%)	35.9
	Processed	25.5 (71%)	3.4 (9%)	7.1 (20%)		36.0
	Value	$ 7.7	$ 1.0	$ 2.3		$ 11.0
1974	Landed	10.0 (23%)	9.7 (23%)	12.2 (29%)	10.5 (25%)	42.4
	Processed	22.1 (60%)	3.7 (10%)	11.3 (30%)		37.1
	Value	$ 7.4	$ 1.0	$ 4.1		$ 12.5
1975	Landed	7.1 (18%)	12.1 (31%)	11.1 (28%)	9.3 (23%)	39.6
	Processed	18.2 (68%)	2.9 (11%)	5.5 (21%)		26.6
	Value	$ 7.3	$ 1.0	$ 2.3		$ 10.6
1976	Landed	6.9 (18%)	13.2 (33%)	11.8 (30%)	7.6 (19%)	39.5
	Processed	21.2 (71%)	1.6 (5%)	6.9 (24%)		29.7
	Value	$ 9.5	$ 0.8	$ 3.4		$ 13.7
1977	Landed	7.4 (14%)	19.6 (38%)	15.9 (31%)	8.8 (17%)	51.7
	Processed	29.7 (58%)	4.9 (10%)	16.1 (32%)		50.7
	Value	$13.0	$ 1.8	$ 7.2		$ 22.0
1978	Landed	8.4 (15%)	17.7 (31%)	18.1 (31%)	13.3 (23%)	57.5
	Processed	25.0 (42%)	13.9 (24%)	20.3 (34%)		59.2
	Value	$13.2	$ 5.6	$10.0		$ 28.8
1979	Landed	7.9 (12%)	18.9 (28%)	25.5 (37%)	15.7 (23%)	68.0
	Processed	35.0 (46%)	10.5 (14%)	30.0 (40%)		75.5
	Value	$18.7	$ 5.5	$15.1		$ 39.3

[1]Compiled from data supplied by the Northeast Fisheries Center, NMFS, NOAA, Woods Hole, Mass., and the Resource Statistics Division, NMFS, NOAA, Washington, D.C.
[2]Processed products of "Other" ports were included in the nearest major port.

The net inflow into Massachusetts agreed fairly well with the difference between landings and processing in the Commonwealth (Tables 1-6). The unexplained difference between landings and processed production was within the range of 5-20 percent except for pollock in recent years and haddock in 1974. We think that the variation was acceptable considering the diverse sources of data and estimation techniques.

Over the decade, the number of processing plants increased in Gloucester and New Bedford and decreased slightly in Boston (Table 8, Fig. 3). Gloucester gained 2 plants and New Bedford 11 plants while Boston lost 2 plants. Average plant size (total groundfish production) increased by 61 percent in Boston and 30 percent in Gloucester between 1970 and 1979, while the average plant size decreased 21 percent in New Bedford. In 1970, average plant size in New Bedford was approximately double that in Boston and Gloucester. While the difference has narrowed, plant size is still slightly larger in New Bedford than in other ports. Plant size in Massachusetts has remained relatively constant throughout the decade. Therefore the number of plants has closely followed the increase in rate of production.

In terms of number of people working, the total employment of the groundfish processing plants decreased in the middle 1970's but recovered for an increase of 8 percent by 1979 over 1970 (Table 9). In 1970,

Table 4.—Haddock landings, production, and product value by port[1] (landed and product weight (converted to landed weight) in millions of pounds and wholesale processed value in millions of dollars).

Year	Item	Boston	Gloucester	New Bedford	Other[2]	Total
1970	Landed	11.6 (52%)	5.4 (24%)	4.0 (18%)	1.1 (6%)	22.1
	Processed	19.3 (84%)	3.0 (13%)	0.7 (3%)		23.0
	Value	$ 6.2	$ 0.8	$ 0.2		$ 7.2
1971	Landed	9.0 (50%)	4.3 (24%)	3.5 (20%)	1.1 (6%)	17.9
	Processed	15.3 (84%)	2.5 (14%)	0.5 (2%)		18.3
	Value	$ 6.0	$ 0.8	$ 0.2		$ 7.0
1972	Landed	3.9 (41%)	3.1 (32%)	1.8 (19%)	0.8 (8%)	9.6
	Processed	12.5 (89%)	1.3 (9%)	0.3 (2%)		14.1
	Value	$ 6.5	$ 0.6	$ 0.1		$ 7.2
1973	Landed	3.4 (50%)	1.5 (22%)	1.3 (19%)	0.6 (9%)	6.8
	Processed	15.8 (88%)	1.8 (10%)	0.3 (2%)		17.9
	Value	$ 8.5	$ 0.7	$ 0.1		$ 9.3
1974	Landed	3.0 (45%)	1.5 (23%)	1.5 (22%)	0.7 (10%)	6.7
	Processed	21.0 (91%)	1.8 (8%)	0.3 (1%)		23.1
	Value	$11.2	$ 0.9	$ 0.1		$ 12.2
1975	Landed	5.0 (39%)	3.7 (29%)	3.4 (26%)	0.7 (6%)	12.8
	Processed	17.0 (83%)	2.3 (11%)	1.3 (6%)		20.6
	Value	$10.4	$ 1.0	$ 0.7		$ 12.1
1976	Landed	3.7 (38%)	3.2 (33%)	2.3 (24%)	0.4 (4%)	9.6
	Processed	21.8 (91%)	1.8 (7%)	0.5 (2%)		24.1
	Value	$15.1	$ 1.3	$ 0.3		$ 16.7
1977	Landed	5.2 (24%)	8.7 (39%)	6.5 (29%)	1.7 (8%)	22.1
	Processed	28.0 (77%)	5.0 (14%)	3.3 (9%)		36.3
	Value	$16.6	$ 2.5	$ 1.7		$ 20.8
1978	Landed	6.5 (22%)	12.3 (42%)	8.1 (28%)	2.3 (8%)	29.2
	Processed	25.3 (60%)	4.0 (10%)	12.8 (30%)		42.1
	Value	$15.9	$ 2.1	$ 6.9		$ 24.9
1979	Landed	6.5 (22%)	11.2 (38%)	10.1 (35%)	1.6 (5%)	29.4
	Processed	24.8 (55%)	8.3 (19%)	11.8 (26%)		44.9
	Value	$18.0	$ 5.5	$ 7.4		$ 30.9

[1]Compiled from data supplied by the Northeast Fisheries Center, NMFS, NOAA, Woods Hole, Mass., and the Resource Statistics Division, NMFS, NOAA, Washington, D.C.

[2]Processed products of "Other" ports were included in the nearest major port.

Boston plants employed an average of 624 persons per month, 43 percent of Massachusetts' fresh groundfish processing workforce. However, Boston's average decreased to 391 per month, 25 percent of the employment in Massachusetts by 1979. The average monthly employment in Gloucester plants increased from 285 per month to 363 per month between 1970 and 1979. The New Bedford plants greatly increased their monthly employment from 532 to 798 per month from 1970 to 1979. Of Massachusetts' fresh fish workers, New Bedford employed 37 percent in 1970 and 51 percent in 1979.

However, comparison between ports is suspect because the questionnaire did not differentiate between part-time and full-time employees. The contract in Boston between the processing firms and the Seafood Workers Union guaranteed 40 hours of work per week for a union employee who worked Monday while the New Bedford contract did not have such a clause, and Gloucester plants were nonunion. Therefore, in New Bedford and Gloucester, where workers could be called in by the day or hour, there were more part-time workers.

Discussion and Conclusions

The first half of the 1970's may be characterized as a period of industrial stagnation for the groundfish industry in Massachusetts. Landings declined until 1977, averaging only about half of what they were in the early 1960's. Revitalization of the groundfish industry began with the FCMA in 1976; by the end of the decade, landings, production, and wholesale value of processed products had increased by 44, 50, and 62 percent, respectively.

After falling steadily throughout the 1960's and early 1970's, the abundance of haddock roughly doubled on Georges Bank and in the Gulf of Maine between 1975 and 1979, matching the increase in cod abundance due to unusually large year classes for both species in 1975[7]. Vessels and processing firms that depended upon haddock landings must have had very difficult times during the late 1960's and early 1970's.

However, not all species shared in the recovery. Yellowtail flounder, the leading groundfish species, steadily declined in landings and production due to a large drop in abundance after 1972[8].

While effort among species in a multispecies fishery is difficult to measure, it seems reasonable that the fleet in Massachusetts, especially in New Bedford, increased concentration on cod and haddock as the stocks increased and the abundance of yellowtail decreased. Overall effort directed at these species increased as the size of the New England fleet of vessels over 60 tons increased from 256 to 430 vessels (68 percent) between 1976 and 1979[9].

The sharp drop in ocean perch landings in Massachusetts from 1964 through 1970 does not seem to have been due to declining abundance in the Gulf of Maine (Clark and Brown, 1977). Rather, the aging fleet of large steamers, built in the 1930's and used

[7]Clark, S., R. Mayo, and E. Faulk. 1981. Georges Bank and Gulf of Maine haddock stock status - 1981. Lab. ref. doc. 81-05. NMFS Northeast Fisheries Center, Woods Hole, Mass. Serchuk, F., and P. Wood, Jr. Assessment and Status of the Georges Bank and Gulf of Maine Atlantic Cod Stocks - 1981. NMFS Northeast Fisheries Center, Woods Hole, Mass.

[8]Clark and Brown (1977) and Clark, S., L. O'Brien, and R. Mayo. 1981. Yellowtail flounder stock status - 1981. Lab. ref. doc. 81-10. NMFS Northeast Fisheries Center, Woods Hole, Mass.

[9]Draft environmental impact statement for the interim fishery management plan for Atlantic groundfish, 1981. New England Fishery Management Council, Saugus Office Park, 5 Broadway, Saugus, MA 01906.

in Gloucester and Maine, were not being replaced. The 5 million pound increase in Massachusetts ocean perch landings since 1974 is misleading since landings in Maine dropped by 13 million pounds over the same period. The overall recent decline in ocean perch landings is due to declining abundance in the Gulf of Maine and the restriction of U.S. vessels from the Canadian grounds since 1978.[10]

Between 1970 and 1974 the quantity of ocean perch processed in Massachusetts was about double what was landed there. The difference was made up from Canadian imports and Maine landings (Table 7). The major products during that period (about 40 percent of the total) were frozen breaded fillets, which could be produced from imported Canadian fresh or frozen fillets. From 1975 through 1979, processed products roughly equaled landings in the Commonwealth as frozen breaded fillets dropped to 20 percent of the total and imported Canadian fresh and frozen fillets dropped from an average of 62 million pounds during 1970 through 1974 to 47 million pounds during the second half of the decade.[11] While more investigation is needed, our data imply that as landings of cod, haddock, pollock, and ocean perch increased and transportation facilities for fresh fillets improved, fresh fillets were substituted for frozen breaded ocean perch fillets.

The pattern of landings by species throughout Massachusetts has changed. Groundfish landings decreased in Boston and New Bedford during the 1970's while landings more than doubled in Gloucester and the other ports. However, Boston and New Bedford processing plants continued to dominate the processing sector with Gloucester plants maintaining their 15 percent share of the market. Boston processing plants increased their purchases of unprocessed cod, haddock, and pollock from Gloucester, other ports in Massachusetts, Maine, and Canada, while New Bedford primary dealers sold less unprocessed cod and haddock to Boston.

The traditional specialization of landings and processing of groundfish by species among the major ports in Massachusetts has also changed. New Bedford traditionally was very highly specialized, primarily landing and processing flounders, particularly yellowtail flounder. But, as the landings of yellowtail flounder dropped from a high of 71 million pounds in 1965 to 20 million pounds in 1978, the New Bedford fleet and groundfish plants adjusted by landing and processing a greater amount of cod and haddock. Flounder production dropped by 8 million pounds while cod production increased by 23 million pounds and haddock production increased by 11 million pounds in New Bedford processing plants during the 1970's. For both cod and haddock, the increase in landings in New Bedford preceded the increase in processed products until the late 1970's when processed products overtook landings for both species.

While the increase in landings and production of all species is recent, wholesale prices increased steadily throughout the 1970's from a weighted average of $0.60/pound in 1970 to $1.56/pound in 1979, approximately 50 percent larger than the increase in

Table 5.—Pollock landings, production, and product value by port[1] (landed and product weight (converted to landed weight) in millions of pounds and wholesale processed value in millions of dollars).

Year	Item	Boston	Gloucester	New Bedford	Other[2]	Total
1970	Landed	3.8 (54%)	2.9 (42%)		0.3 (4%)	7.0
	Processed	6.8 (88%)	0.9 (12%)			7.7
	Value	$ 1.1	$ 0.1			$ 1.2
1971	Landed	4.6 (53%)	3.5 (41%)		0.5 (6%)	8.6
	Processed	4.6 (81%)	1.1 (19%)			5.7
	Value	$ 0.7	$ 0.2			$ 0.9
1972	Landed	3.6 (36%)	5.6 (56%)		0.8 (8%)	10.0
	Processed	3.9 (66%)	2.0 (34%)			5.9
	Value	$ 0.9	$ 0.4			$ 1.3
1973	Landed	3.9 (39%)	4.7 (46%)		1.5 (15%)	10.1
	Processed	9.3 (82%)	2.0 (18%)			11.3
	Value	$ 2.3	$ 0.4			$ 2.7
1974	Landed	6.0 (46%)	5.5 (42%)	0.4 (3%)	1.2 (9%)	13.1
	Processed	10.0 (75%)	3.3 (25%)			13.3
	Value	$ 2.5	$ 0.7			$ 3.2
1975	Landed	4.7 (39%)	6.2 (51%)	0.5 (4%)	0.8 (6%)	12.2
	Processed	9.4 (80%)	2.2 (18%)	0.2 (2%)		11.8
	Value	$ 2.8	$ 0.6	$ 0.1		$ 3.5
1976	Landed	5.0 (38%)	6.7 (51%)	0.8 (6%)	0.6 (5%)	13.1
	Processed	10.8 (79%)	2.6 (19%)	0.2 (2%)		13.6
	Value	$ 3.3	$ 0.9	$ 0.1		$ 4.3
1977	Landed	2.9 (20%)	8.2 (57%)	1.9 (13%)	1.3 (9%)	14.3
	Processed	10.9 (78%)	2.6 (19%)	0.4 (3%)		13.9
	Value	$ 3.9	$ 0.8	$ 0.2		$ 4.9
1978	Landed	3.8 (20%)	11.5 (60%)	1.5 (8%)	2.2 (12%)	19.0
	Processed	10.9 (72%)	3.5 (23%)	0.7 (5%)		15.1
	Value	$ 4.2	$ 1.1	$ 0.3		$ 5.6
1979	Landed	3.5 (20%)	10.0 (59%)	1.8 (11%)	1.7 (10%)	17.0
	Processed	11.4 (66%)	4.6 (27%)	1.3 (7%)		17.3
	Value	$ 5.1	$ 1.5	$ 0.6		$ 7.2

[1]Compiled from data supplied by the Northeast Fisheries Center, NMFS, NOAA, Woods Hole, Mass., and the Resource Statistics Division, NMFS, NOAA, Washington, D.C.

[2]Processed products of "Other" ports were included in the nearest major port. New Bedford totals to 1974 (less than 0.5 million pounds) were included in Boston since there were less than three processors of pollock in the port.

[10]Stephen Clark, NMFS Northeast Fisheries Center, Woods Hole, Mass. Pers. commun.

[11]Production totals are from processed products data, NMFS Resource and Statistics Division, Washington, D.C. Summary statistics on ocean perch are available from the senior author. Import statistics are from the U.S. Bureau of Census and are available from R. Cory, Center for Ocean Management Studies, U.R.I., Kingston, RI 02881.

Table 6.—Ocean perch landings, production, and product value by port[1] (landed and product weight (converted to landed weight) in millions of pounds and wholesale processed value in millions of dollars).

Year	Item	Boston	Gloucester	New Bedford	Other[2]	Total	Total (excluding breaded fillets)
1970	Landed	1.1 (13%)	7.5 (87%)			8.6	8.6
	Processed	4.6 (27%)	12.5 (73%)			17.1	10.7
	Value	$ 0.6	$ 1.2			$ 1.8	$ 0.8
1971	Landed	1.1 (8%)	12.2 (92%)			13.3	13.3
	Processed	3.6 (17%)	17.1 (83%)			20.7	12.5
	Value	$ 0.5	$ 1.8			$ 2.3	$ 1.3
1972	Landed	1.6 (10%)	14.5 (90%)			16.1	16.1
	Processed	3.2 (13%)	20.7 (87%)			23.9	16.1
	Value	$ 0.5	$ 3.0			$ 3.5	$ 2.2
1973	Landed	2.4 (14%)	14.7 (86%)			17.1	17.1
	Processed	3.9 (15%)	22.5 (85%)			26.4	17.2
	Value	$ 0.8	$ 3.7			$ 4.5	$ 2.7
1974	Landed	1.9 (17%)	8.6 (79%)	0.4 (4%)		10.9	10.9
	Processed	5.0 (25%)	15.0 (75%)			20.0	13.9
	Value	$ 1.0	$ 2.2			$ 3.2	$ 2.0
1975	Landed	2.4 (23%)	8.1 (77%)			10.5	10.5
	Processed	4.3 (35%)	7.9 (65%)			12.1	10.4
	Value	$ 1.1	$ 1.5			$ 2.6	$ 2.2
1976	Landed	2.6 (23%)	8.7 (77%)			11.3	11.3
	Processed	5.7 (46%)	6.8 (54%)			12.5	12.1
	Value	$ 1.7	$ 1.8			$ 3.5	$ 3.4
1977	Landed	2.2 (16%)	11.9 (84%)			14.1	14.1
	Processed	5.0 (32%)	10.4 (68%)			15.4	14.3
	Value	$ 1.6	$ 2.8			$ 4.4	$ 4.0
1978	Landed	2.8 (21%)	10.3 (79%)			13.1	13.1
	Processed	4.7 (33%)	9.6 (67%)			14.3	10.7
	Value	$ 1.5	$ 2.7			$ 4.2	$ 3.3
1979	Landed	6.4 (40%)	9.7 (60%)			16.1	16.1
	Processed	5.4 (36%)	9.6 (64%)			15.0	12.2
	Value	$ 2.2	$ 3.4			$ 5.6	$ 5.3

[1]Compiled from data supplied by the Northeast Fisheries Center, NMFS, NOAA, Woods Hole, Mass., and the Resource Statistics Division, NMFS, NOAA, Washington, D.C.
[2]Processed products of "Other" ports were included in the nearest major port. New Bedford totals (less than 0.5 million pounds) were included with Boston figures since there were less than three processors of ocean perch in the port.

Table 7.—Shipments of unprocessed fish into Massachusetts (In) from Canada, Maine, and Newport, R.I., and out of Massachusetts (Out) to the Fulton Fish Market[1] (landed weight in millions of pounds).

Year	Item	Flounders	Cod	Haddock	Pollock	Ocean perch
1974	In	13.4	4.3	7.6	2.0	9.2
	Out	10.4	7.8	0.0	1.3	0.1
	Diff.	3.0	(3.5)	7.6	0.7	9.1
1975	In	11.6	0.8	7.7	3.6	2.0
	Out	11.3	7.1	0.0	1.1	0.1
	Diff.	0.3	(6.3)	7.7	2.5	1.9
1976	In	13.4	5.4	8.5	4.9	0.0
	Out	9.7	6.4	0.0	1.0	0.0
	Diff.	3.7	(1.0)	8.5	3.9	0.0
1977	In	15.6	8.7	7.3	6.4	0.0
	Out	11.5	6.7	0.0	1.1	0.0
	Diff.	4.1	2.0	7.3	5.3	0.0
1978	In	16.1	8.0	8.6	7.4	0.0
	Out	11.8	8.8	0.0	1.3	0.0
	Diff.	4.3	(0.8)	8.6	6.1	0.0
1979	In	22.4	8.2	10.4	5.2	0.0
	Out	11.4	8.7	0.0	1.1	0.1
	Diff.	11.0	(0.5)	13.6	4.1	(0.1)

[1]Compiled from data supplied by the Northeast Fisheries Center, NMFS, NOAA, Woods Hole, Mass., and the *New York Market News*, NMFS, NOAA, New York, N.Y.

Table 8.—Number of fresh groundfish plants (P) and average yearly production per plant (AP) by port[1] (product weight in thousands of pounds).

Year	Item	Boston	Glouces-ter	New Bedford	Totals
1970	P	27	8	14	49
	AP	837	1,075	1,943	1,192[2]
1971	P	24	8	13	45
	AP	833	1,100	1,885	1,184
1972	P	22	7	14	43
	AP	718	1,314	1,729	1,144
1973	P	23	8	14	45
	AP	1,057	1,488	1,850	1,380
1974	P	24	7	16	47
	AP	1,038	1,329	1,569	1,262
1975	P	23	7	17	47
	AP	935	300	1,400	1,083
1976	P	23	6	17	46
	AP	1,139	800	1,541	1,243
1977	P	23	9	21	53
	AP	1,391	1,078	1,267	1,289
1978	P	25	11	22	58
	AP	1,144	1,345	1,509	1,321
1979	P	25	10	25	60
	AP	1,344	1,400	1,532	1,432

[1]Compiled from data supplied by the Resource Statistics Division, NMFS, NOAA, Washington, D.C.
[2]Weighted average yearly production of plants in the major Massachusetts ports.

Table 9.—Employment in fresh groundfish plants by port[1] (yearly average number employed per month).

Year	Boston	Gloucester	New Bedford	Total
1970	624	285	532	1441
1971	585	268	591	1444
1972	579	263	545	1387
1973	618	381	552	1551
1974	585	273	594	1452
1975	516	251	588	1355
1976	397	223	594	1214
1977	348	351	666	1365
1978	346	421	737	1504
1979	391	363	798	1552

[1]Compiled from data supplied by the Resource Statistics Division, NMFS, NOAA, Washington, D.C.

the average wholesale price of meat, poultry, and fish over the same period (Fig. 3 and USDL, 1971-79). During the early 1970's the price increase was apparently due to a reduction in supply. In the late 1970's the increase in supply was overshadowed by the increase in demand, perhaps due to increasing public awareness of circulatory diseases associated with high cholesterol diets.

These results indicate that established processing plants and fishing vessels found it more profitable to turn to other traditional species rather than toward nontraditional species, when the favored traditional species became less available. The increase in wholesale prices during the 1970's helps to explain why processing firms were not anxious to turn toward nontraditional species. Also, developing markets for nontraditional species was costly and could not be recouped over a long period, since, once the market was established, other processing firms would enter and bid down the high rates of return. The increasing prosperity of the traditional groundfish industry was much more appealing to established processing firms.

The choice of a different traditional species over a nontraditional species is easy to understand once the components of a switch to nontraditional species are considered. Boats must change gear, work procedures, and trip patterns. Skippers must learn the location and habits of the new species. Unloading facilities and methods must be changed. Processing plant equipment and work must be adapted to the new species. And, most importantly, plant owners, managers, and sales people must make new marketing arrangements with new customers in an initial atmosphere of apprehension between buyer and seller. Furthermore, all these changes require financing and must happen more or less simultaneously among participants who may not have been especially cooperative in the past. The choice of another traditional species must be a welcome relief to a local fishing industry.

However, the promotion of a nontraditional species succeeded when pollock was introduced in Boston. The Boston Fisheries Association and the U.S. Bureau of Commercial Fisheries (predecessor to the NMFS) promoted pollock through advertising, supermarket displays, and subsidies for pollock landings during the 1960's in a successful campaign to encourage demand and supply for pollock when haddock was becoming scarce. Boston processing plants were able to initiate and maintain their predominance of the pollock market throughout the 1970's. Plans to utilize nontraditional species should consider the experience of the Boston pollock industry. However, pollock may be a special case, since it is a close substitute to cod and haddock in fishing, processing, and retailing.

Finally, while some technological changes occurred in the fishing sector in the 1970's—including the changeover from side trawlers to stern trawlers and toward larger vessels with greater fishing power—there was little technological change in the processing sector. The overall average plant size in Massachusetts remained about the same, increasing somewhat in Boston and Gloucester and decreasing in New Bedford. Currently the average plant size is about the same in the three ports, averaging 28,000 pounds of product per week. Fresh groundfish plants are small, labor intensive, and family owned because of the rapid deterioration of the product and large variation in supply and demand. There is a very recent trend toward automated filleting machines. These were available prior to the 1970's but apparently the low volume of landings, the inconsistency of input, or relatively low wages of cutters, or a combination of the three did not justify their cost.

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Literature Cited

Clark, S. H., and B. E. Brown. 1977. Changes in biomass of finfishes and squids from the Gulf of Maine to Cape Hatteras, 1963-74, as determined from research vessel survey data. Fish. Bull., U.S. 75:1-21.

Smith, L., and S. Peterson. 1977. The New England fishing industry: a basis for management. Tech. rep., Woods Hole Oceanographic Institution, Woods Hole, Mass., 130 p.

USDC. 1980. Fisheries of the United States, 1979. U.S. Dep. Commer., NOAA, Natl. Mar. Fish. Serv., Curr. Fish. Stat. 8000.

USDL. 1971-79. Monthly labor review. U.S. Dep. Labor, Wash., D.C.

White, D. 1954. The New England fishing industry. Harvard Univ. Press, Cambridge, Mass., 205 p.

An Estimate of Harvest by the Texas Charter Boat Fishery

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ABSTRACT—The charter boat fishery in surveyed areas of the Texas coast harvested over 900,000 fish in fiscal year 1979; 71 percent were taken from the Gulf and 29 percent from the bays. Red snapper, Lutjanus campechanus; *king mackerel,* Scomberomorus cavalla; *and Spanish mackerel,* S. maculatus, *constituted the majority (78 percent) of the Gulf catch. Sand seatrout,* Cynoscion arenarius; *spotted seatrout,* C. nebulosus; *Atlantic croaker,* Micropogonias undulatus; *and kingfish,* Menticirrhus *sp., constituted the majority of the bay catch. Catch composition within the Gulf and bay varied greatly between party boats (≤10 people) and headboats (>10 people). Catch rates by charter boat fishermen were generally higher than catch rates for private boat fishermen. The knowledge and experience of charter boat captains and the species preference of their clients may have influenced the success of fishermen. Characteristics of fishermen and their guides may influence catch rates as much as fluctuations in fish stocks.*

Introduction

The charter boat fishery from the Florida west coast to Texas received over $20 million in fees alone in 1970 (Bureau of Sport Fisheries and Wildlife, 1972). In 1975, Texas fishermen spent $1.3 million on charter fees (Woods and Ditton, 1979). Although economically important, the Texas charter boat fishery was essentially ignored by fisheries scientists until late 1974. Heffernan et al. (1976) estimated that 29,937 fish were landed from the Aransas Bay system by 1,460 fishermen in fiscal year 1975 (September 1974-August 1975). Almost 99 percent of this harvest was spotted seatrout, *Cynoscion nebulosus.* Mean size of spotted seatrout (259 mm TL) and mean seasonal catch rates (≤ 5.50 fish/man-hour) were also estimated.

Trent (1976) reported that ~50,500 man-days were spent by headboat fishermen in the Gulf of Mexico off the Texas coast from Port Aransas to Port Isabel during April 1975-April 1976. These fishermen landed primarily red snapper, *Lutjanus campechanus.* Woods and Ditton (1979) estimated ~35,200 man-days were spent along the Texas coast in calendar year 1975 on small Gulf ($\bar{x}$ = 6 persons/party) and bay ($\bar{x}$ = 4 persons/party) charter boats. No estimates of harvest were made, but they reported that spotted seatrout and red drum, *Sciaenops ocellatus,* were sought by bay fishermen and that red snapper, mackerel, *Scomberomorus* sp.; and cobia, *Rachycentron canadum,* were sought by Gulf fishermen. The characteristics, participation patterns, and motivation of charter boat clients and the organization and business characteristics of the Texas boat owners and operators were described by Ditton et al. (1978a,b). They reported that the charter boat industry was composed of "small independent businesses which operate at moderate to high profit margins but which do not yield sufficient cash to keep a large number of operators in business full time," and that charter fishermen were an important group "to which goals of fisheries management must be addressed." Use of arti-

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Figure 1.—The Texas coastal area.

ficial submerged Gulf reefs by charter boats has been examined by Vetter and Roels (1977), Ditton and Graefe (1978), and Ditton et al. (1979). They found that the charter fishing industry utilized the Gulf reefs much more off the upper Texas coast than off the lower coast.

The harvest of fish by charter boats from Texas' salt water has not been previously determined. This fishery operates in inside (bay) waters, the territorial sea (within 16.7 km of the barrier islands), and the Fishery Conservation Zone (16.7-322 km). The species targeted also support other fisheries, both recreational and commercial. The continued success of the charter boat fishery in Texas is dependent upon effective management of the fishery resources allocated to competing user groups.

Information on the amount of fish currently harvested by the charter boat fishery is needed to determine total harvest and fishing pressure estimates for bay and Gulf fishery management. McEachron (1980) summarized the data collected from charter boat fishermen in fiscal year 1979 (September 1978-August 1979) but did not estimate harvest. This paper provides an estimate of fish harvest by charter boats from Texas' salt water from September 1978 through August 1979.

Figure 2.—A typical headboat used on Texas bays.

Table 1.—Number of charter boats inventoried on the Texas coast and average number of trips made per boat per year during September 1978-August 1979.

Coastal area	Gulf				Bay			
	Headboat		Party[1,2]		Headboat		Party[1,2]	
	Boats	Trips[3]	Boats	Trips	Boats	Trips[4]	Boats	Trips
Upper	7	225	14.5	68	3	264	6.5	100
Middle	[5]6	225	55.5	68	4	264	23.5	100
Lower	2	ND[6]	22	ND	3	264	17	100
Total	13	225	70.0	68	10	264	47	100

[1]Trips by boats fishing in both the bay and Gulf were allocated equaliy to each area.
[2]Trip estimates obtained from Woods and Ditton (1979).
[3]Estimated by: Number of days of interviews completed/number of days of interviews scheduled.
[4]Based on 116 trips/boat in winter/spring and 148 trips/boat in summer/fall. Estimated by: Number of days of interviews completed/number of days of interviews scheduled.
[5]Four boats made short (<8 hours) trips only and generally operated 6 months.
[6]ND = no data.

Materials and Methods

From September 1978 through August 1979, charter boats in three areas along the Texas coast were surveyed. Boats on the upper (Galveston/Freeport), middle (Rockport/Port Aransas/Corpus Christi), and lower (Port Mansfield/Port Isabel coastal areas were inventoried prior to the survey using fish guide license sales data (Table 1) and according to a classification as follows:

1) Capacity (maximum number of fishermen carried)
   a) Party boat (a boat operated by a guide and crew which carries ≤10 people for a fee);
   b) Headboat (a boat operated by a guide and crew which carries >10 people for a fee).
2) Location of fishing (relative to barrier islands and Gulf entrance of passes)
   a) Gulf (that area seaward of the barrier islands and the pass entrances);
   b) Bay (that area shoreward of barrier islands and the pass entrances).

Inventories were updated as boats entered or left the fishery.

During each quarter of the year (beginning in September) surveys were scheduled on each of 15 randomly selected weekdays and 7 weekend days in each area except the lower area where 13 weekdays and 5 weekend days were randomly selected. The type of boat selected on each survey day was determined by the interviewer. If no survey could be conducted, an alternate day of the same type scheduled was randomly selected. When possible, 25 percent of the surveys for each day type were allocated to each boat type.

Headboat surveys were conducted aboard the vessel during the fishing trip; party boats were intercepted at the dock after the trip. Each fish retained on each trip was counted and identified to species (Hoese and Moore, 1977; Robins et al., 1980) when possible. Also on each trip, the number of fishermen and the trip time for party boats or the actual fishing time for headboats (to the nearest 0.5 hour) were recorded. Retention rates (synonymously called catch rates) were calculated on a trip basis by

Table 2.—Total fish harvest (no. ± 1 SE) by recreational fishermen on headboats and party boats in the Gulf of Mexico off the upper and middle Texas coast during September 1978-August 1979. (Blanks indicate no analysis conducted.)

Boat type	Gulf area	Red snapper	King mackerel	Spanish mackerel	Total
Headboat	Upper	341,507 ± 62,293			433,125 ± 73,631
	Middle	97,574 ± 17,798			123,750 ± 21,038
	Both	439,081 ± 80,092			556,875 ± 96,021
Party boat	Upper[1]	5,748 ± 2,255	5,235 ± 1,728	3,922 ± 1,686	16,190 ± 3,076
	Middle[2]	566 ± 558	20,849 ± 6,844	15,689 ± 6,746	61,969 ± 11,556
	Both	6,314 ± [3]1,086	26,084 ± 8,562	19,611 ± 8,406	78,159 ± 14,575

[1]Fourteen party boats operated in the Gulf only and one party boat operated in the Gulf and bay from the Galveston area.
[2]Fifty party boats operated in the Gulf only and eleven party boats operated in the Gulf and bay from the Port Aransas area.
[3]Summation of harvest calculated independently for party boats in Galveston and Port Aransas.

Table 3.—Mean catch rate (no./man hour ± 1 SE) and total annual harvest of fish (no. ± 1 SE) by recreational fishermen from headboats in the Gulf of Mexico off the middle Texas coast during short trips (<8 hours) only.

Species	Catch rate	Total harvest
King mackerel	0.03 ± 0.01	2,125 ± 634
Total fish	0.08 ± 0.02	5,750 ± 1,383

dividing the total fish retained by the number of fishermen and the fishing time or the trip length. Mean catch rates for each boat type, in each area for each day type were calculated as arithmetic means of the catch rates on each trip.

Significant ($P = 0.01$) differences among mean catch rates for the major species caught and for total catch by fishermen on each boat type were determined using factorial analysis of variance (Overall and Spiegel, 1969). Catch rates were transformed to common logarithms before analyses. The mean catch rates for both red snapper and total fish by Gulf headboat fishermen in the upper and middle areas on weekdays and weekend days were tested. No weekend headboat or party boat surveys were conducted in the lower Gulf area because of lack of cooperation from boat operators. The mean catch rates for each of red snapper, king mackerel, *S. cavalla*; Spanish mackerel, *S. maculatus*; and total fish by Gulf party boat fishermen in the two areas for the two day types were also tested. The mean catch rates of spotted seatrout and total fish by bay charter boat fishermen in the three areas for the two day types were tested. The mean catch rates for each of sand seatrout, *C. arenarius;* Atlantic croaker, *Micropogonias undulatus;* kingfish, *Menticirrhus* sp.; and total fish by bay headboat fishermen in the three areas for the two day types in the winter/spring and summer/fall were tested. When no differences were found among areas, day types, or seasons, one mean catch rate was calculated using all of the data combined to estimate total harvest.

Total harvests were calculated by multiplying the mean catch/trip by the mean trips/boat/year by the number of inventoried boats. The mean number of trips/boat/year for party boats was obtained from Woods and Ditton (1979). For headboats, the number of trips/boat was determined by dividing the number of days of completed surveys by the number of survey days scheduled. This figure was multiplied by the number of days in a year. Boats that fished in both the Gulf and bays were assumed to exert 50 percent of their effort in each area. Standard errors of harvest estimates were calculated according to Cochran (1977). Gulf harvest was estimated for the upper and middle coast; bay harvest was estimated for the Galveston, Aransas, and Corpus Christi Bay systems and the lower Laguna Madre system.

Results

Recreational fishermen fishing from charter boats in the surveyed areas of the Gulf of Mexico off the Texas coast caught 640,784 ± 111,979 fish during September 1978 through August 1979 (Table 2, 3). Red snapper, king mackerel, and Spanish mackerel constituted the majority (78 percent) of the catch. Headboat fishermen caught mainly red snapper at a rate of 1.40 ± 0.30 fish man/hour (Table 4). Party boat fishermen caught mainly mackerel. Thirty-four other species were also caught by Gulf charter boat fishermen (Table 5).

Red snapper catch rates on party boats were significantly greater in the upper Gulf than in the lower Gulf (Table 6). Otherwise, no significant ($P = 0.01$) differences were found for total fish, king mackerel, Spanish mackerel, or red snapper for either head or party boats.

Recreational fishermen fishing from charter boats in Texas bays caught 264,821 ± 40,350 fish during the year (Table 7, 8). Sand seatrout, spotted seatrout, Atlantic croaker, and kingfish constituted the majority (93 percent) of the catch. Headboat fishermen landed mainly sand seatrout with catch rates generally exceeding 0.2 fish/man-hour (Table 9). Party boat fishermen caught mainly spotted seatrout at about 1 fish/man trip-hour (Table 10). Thirteen other species were also caught by bay charter boat fishermen (Table 5).

Sand seatrout, Atlantic croaker, and total fish catch rates on bay headboats were significantly higher in the summer/fall than in the winter/spring except in the Aransas Bay system where catches of Atlantic croaker were about the same in the two seasons (Table 11). Spotted seatrout and total fish catch rates on bay party boats were significantly lower (by about 50 percent) on weekends than on weekdays (Table 12). No other significant differences were found among catch rates on bay charter boats.

Discussion

Until recently, the impact of recreational fishing on fish stocks in the Gulf of Mexico and adjacent estuarine systems was essentially ignored.

Since the passage of the Fishery Conservation and Management Act in 1976, fisheries managers in the Gulf have been forced to reexamine the available data on the harvest of fish by recreational fishermen. The realization that there were few reliable data on recreational harvest was coupled with an awareness that what data were available indicated that the recreational harvest was far from insignificant (Heffernan and Kemp, 1980). This study further supports the need to consider the fish harvest by all fishermen in the effective management of marine and estuarine fish stocks.

The charter boat fishery in Texas harvested over 900,000 fish in fiscal year 1979; 71 percent were taken from the Gulf and 29 percent from the bays. In the same year commercial fishermen reported landing 2,219,000 kg of fish in Texas (Hamilton, 1980). Assuming the commercially landed fish averaged 1 kg, the charter boat harvest was about 40 percent of the reported commercial fish harvest.

The National Marine Fisheries Service has estimated that charter boat fishermen landed 2,246,000 fish from the Gulf and bay waters of the five Gulf states (NMFS, 1980). If the proportions reported for Gulf subregion applied in Texas (50 percent of the fish caught were landed and 7.4 percent of the landings were accounted for by charter boats), then an estimated 1,315,000 fish were landed in Texas by charter boats. The Texas landings accounted for 60 percent of the total Gulf subregion charter harvest in calendar year 1979. Our study yielded similar results; at least 40 percent of the charter boat harvest in the Gulf subregion occurred in Texas. Any apparent difference between our

Table 4.—Mean catch rate (no./man-hour on headboats and no./man trip-hour on party boats ± 1 SE) of fish by charter Gulf boat fishermen off the upper and middle Texas coast on weekdays and weekends during September 1978-August 1979. (Blanks indicate no analysis conducted; numbers in parentheses indicate number of interview days; NA = not applicable.)

Boat type	Gulf area	Day type	Red snapper	King mackerel	Spanish mackerel	Total fish
Headboat	Upper	Weekday	1.06 ± 0.24 (10)			1.30 ± 0.27 (10)
		Weekend	1.16 ± 0.28 (8)			1.40 ± 0.25 (8)
	Middle	Weekday	1.56 ± 0.28 (3)			2.23 ± 0.63 (3)
		Weekend	3.30 ± 3.02 (2)			4.22 ± 3.20 (2)
	Both areas	Both day types	1.40 ± 0.30 (23)			1.70 ± 0.30 (23)
Party boat	Upper	Weekday	0.08 ± 0.02 (3)	0.13 ± 0.09 (3)	0.05 ± 0.05 (3)	0.30 ± 0.08 (3)
		Weekend	0.09 ± 0.09 (3)	0.15 ± 0.14 (3)	0.26 ± 0.25 (3)	0.54 ± 0.12 (3)
		Combined	0.08 ± 0.04 (6)	NA	NA	NA
	Middle	Weekday	0.00 ± 0.00 (15)	0.19 ± 0.06 (15)	0.12 ± 0.09 (15)	0.47 ± 0.10 (15)
		Weekend	0.02 ± 0.02 (12)	0.08 ± 0.02 (12)	0.10 ± 0.09 (12)	0.62 ± 0.39 (12)
		Combined	0.01 ± 0.01 (27)	NA	NA	NA
	Both areas	Both day types	NA[1]	0.14 ± 0.03 (33)	0.12 ± 0.05 (33)	0.50 ± 0.10 (33)

[1]Significant difference between mean catch rate off upper (0.08 ± 0.04 fish/man trip-hour) and off middle (0.01 ± 0.01 fish/man trip-hour) Texas coast.

Table 5.—List of species retained by charter boat fishermen along the Texas coast during September 1978-August 1979. (X = presence, blank = absence.)

Species		Bay		Gulf		Species		Bay		Gulf	
Common name	Scientific name	Party	Head	Party	Head	Common name	Scientific name	Party	Head	Party	Head
Spanish mackerel	*Scomberomorus maculatus*	X		X	X	Sand seatrout	*Cynoscion arenarius*		X	X	
Sheepshead	*Archosargus probatocephalus*	X			X	Dolphin	*Coryphaena hippurus*			X	
						Kingfish	*Menticirrhus* sp.		X		
Red drum	*Sciaenops ocellatus*	X	X			King mackerel	*Scomberomorus cavalla*			X	X
Southern flounder	*Paralichthys lethostigma*	X	X		X	Red snapper	*Lutjanus campechanus*			X	X
Black drum	*Pogonias cromis*		X			Rock hind	*Epinephelus adscensionis*				X
Florida pompano	*Trachinotus carolinus*		X			Blacktip shark	*Carcharhinus limbatus*				X
Pigfish	*Orthopristis chrysoptera*		X			Longspine porgy	*Stenotomus caprinus*				X
Greater amberjack	*Seriola dumerili*			X	X	Ocean triggerfish	*Canthidermis sufflamen*				X
Gafftopsail catfish	*Bagre marinus*	X	X			Gulf toadfish	*Opsanus beta*				X
Ladyfish	*Elops saurus*	X				Gray snapper	*Lutjanus griseus*				X
Cobia	*Rachycentron canadum*			X	X	Remora	Echeneidae				X
Hardhead catfish	*Arius felis*	X	X			Lane snapper	*Lutjanus synagris*				X
Blue runner	*Caranx crysos*			X	X	Bluefin tuna	*Thunnus thynnus*				X
Hammerhead shark	*Sphyrna* sp.		X		X	Bull shark	*Carcharhinus leucas*				X
Crevalle jack	*Caranx hippos*			X	X	Scamp	*Mycteroperca phenax*				X
Spotted seatrout	*Cynoscion nebulosus*	X	X			Tomtate	*Haemulon aurolineatum*				X
Shrimp eel	*Ophichthus gomesi*		X			Vermillion snapper	*Rhomboplites aurorubens*				X
Pinfish	*Lagodon rhomboides*		X		X	Bluefish	*Pomatomus saltatrix*				X
Atlantic sharpnose shark	*Rhizoprionodon terraenovae*					Queen triggerfish	*Balistes vetula*				X
				X	X	Rock sea bass	*Centropristis philadelphica*				X
Atlantic bonito	*Sarda sarda*			X		Jewfish	*Epinephelus itajara*				X
Great barracuda	*Sphyraena barracuda*			X		Gray triggerfish	*Balistes capriscus*				X
Atlantic croaker	*Micropogonias undulatus*		X	X		Knobbed porgy	*Calamus nodosus*				X
						Warsaw grouper	*Epinephelus nigritus*				X

Table 6.—Summary of results of two-way analysis of variance of mean catch rates (no./trip-hour for party boats and no./man-hour for headboats) of selected species by fishermen on party boats and headboats in two areas of the Gulf off Texas on weekdays and weekends.

		Party boats		Head boats				Party boats		Head boats	
Species	Source of variation	Mean square (df)	F	Mean square (df)	F	Species	Source of variation	Mean square (df)	F	Mean square (df)	F
Red snapper	Total	0.001 (32)		0.040 (22)		King mackerel	Total	0.004 (32)		Not analyzed	
	Gulf area	0.004 (1)	8.728 **	0.080 (1)	1.952 NS		Gulf area	0.000 (1)	0.011 NS		
	Day type	0.000 (1)	0.646 NS	0.007 (1)	0.180 NS		Day type	0.008 (1)	1.807 NS		
	Gulf area × day type	0.000 (1)	0.083 NS	0.003 (1)	0.080 NS		Gulf area × day type	0.002 (1)	0.562 NS		
	Error	0.001 (29)		0.041 (19)			Error	0.004 (29)			
Spanish mackerel	Total	0.007 (32)		Not analyzed		Total fish	Total	0.020 (32)		0.037 (22)	
	Gulf area	0.001 (1)	0.186 NS				Gulf area	0.000 (1)	0.001 NS	0.155 (1)	4.618 NS
	Day type	0.001 (1)	0.152 NS				Day type	0.000 (1)	0.003 NS	0.015 (1)	0.441 NS
	Gulf area × day type	0.005 (1)	0.689 NS				Gulf area × day type	0.009 (1)	0.425 NS	0.008 (1)	0.230 NS
	Error	0.008 (29)					Error	0.021 (29)		0.034 (19)	

** $P<0.01$
NS = not significant at $P = 0.01$

estimate and that of the NMFS may be the result of the different time periods sampled (fiscal year vs. calendar year). Additionally, we did not survey the charter boats operating in the Gulf along the lower Texas coast. These boats represented about 25 percent of the total Texas Gulf charter boat fleet. If the harvest per boat for these nonsampled boats was the same as for the sampled boats on the middle and upper coast, then our estimate would be increased to ~1,125,000 fish. Trent (1976) found that fishermen on headboats on the lower Texas coast had catch rates five times greater than those on the middle coast but exerted five times less fishing pressure. This indicates a similar mean harvest per boat between the two areas.

McConnell et al. (1981) stated that the species and number of fish caught is largely determined by the place the angler fishes. The Gulf charter boat fishery off Texas harvested mainly red snapper, king mackerel, and Spanish mackerel. The bay charter boat fishery harvested mainly spotted seatrout, sand seatrout, and Atlantic croaker. McEachron and Green (1982), McEachron et al. (1981), and Trent (1976) reported that private Gulf boat fishermen landed red snapper and king mackerel mainly, and that bay boat, pier, and wade/bank fishermen landed spotted seatrout, sand seatrout, and Atlantic croaker mainly.

Table 7.—Total harvest (no. ± 1 SE) by fishermen on headboats in Texas bays during September 1978-August 1979.

		Bay system			
Species	Season	Galveston	Aransas/Corpus Christi	Lower Laguna Madre	Total
Sand seatrout	Winter/spring	5,732 ± 2,142	7,642 ± 2,856	5,732 ± 2,142	19,106 ± 7,139
	Summer/fall	34,823 ± 13,101	46,431 ± 17,468	34,823 ± 13,101	116,007 ± 43,669
	Total	40,555 ± 9,387	54,073 ± 12,515	40,555 ± 9,387	135,183 ± 31,288
Atlantic croaker	Winter/spring	696 ± 476	255 ± 211	45 ± 44	996 ± 316
	Summer/fall	17,218 ± 7,800	539 ± 370	311 ± 133	18,068 ± 4,279
	Total	17,914 ± 5,244	794 ± 301	356 ± 104	19,064 ± 3,034
Kingfish	Winter/spring	882 ± 172	1,176 ± 229	882 ± 172	2,940 ± 572
	Summer/fall	1,122 ± 219	1,496 ± 292	1,122 ± 219	3,740 ± 730
	Total	2,004 ± 391	2,672 ± 521	2,004 ± 391	6,680 ± 1,302
Total	Winter/spring	8,014 ± 3,809	10,686 ± 5,078	8,014 ± 4,466	26,714 ± 7,687
	Summer/fall	44,267 ± [1]13,195	59,022 ± 17,594	44,267 ± 13,195	147,556 ± 43,985
	Total	52,281 ± [1]9,472	69,708 ± 12,629	52,281 ± 9,472	174,270 ± 31,573

[1]Total harvest does not equal the summation of individual species harvest because of one trip on which 869 sand seatrout were caught, and total harvest is estimated independently of each species harvest estimate.

Table 8.—Total harvest (no. ± 1 SE) by fishermen on party boats in Texas bays during September 1978-August 1979.

	Bay system			
Species	Galveston	Aransas/Corpus Christi	Lower Laguna Madre	Total
Spotted seatrout	11,829 ± 559	42,764 ± 4,378	30,935 ± 3,167	85,528 ± 8,755
Total fish	12,523 ± 1,214	45,276 ± 4,388	32,753 ± 3,175	90,551 ± 8,777

The charter boat fishery in other areas of the southeastern United States also harvests mackerels and red snapper, but the relative importance of these species varies greatly. Off Louisiana, silver seatrout, *C. nothus*; Atlantic croaker, "bull" red drum, and king mackerel were dominant fishes in the charter boat landings (Dugas et al., 1979). Alabama's charter boat industry landed mainly amberjack, *S. dumerili*; king mackerel, snapper (Lutjanidae), and little tunny, *Euthynnus aletteratus*

Table 9.—Mean catch rate (no./man-hour ± 1 SE) of sand seatrout, Atlantic croaker, kingfish, and total fish by fishermen on headboats in Texas bays during winter/spring and summer/fall.

Species	Bay system	Winter/spring		Summer/fall	
		Weekday	Weekend	Weekday	Weekend
Sand seatrout	Galveston	0.76 ± 0.53 (9)	0.39 ± 0.39 (2)	1.11 ± 0.94 (7)	3.36 ± 1.48 (2)
	Aransas/Corpus Christi	0.18 ± 0.07 (7)	0.16 ± 0.08 (4)	1.56 ± 0.25 (6)	2.84 ± 0.82 (5)
	Lower Laguna Madre	0.27 ± 0.16 (6)	0.19 ± 0.19 (2)	0.68 ± 0.37 (7)	0.22 ± 0.06 (4)
Atlantic croaker	Galveston	0.06 ± 0.04 (9)	0.00 ± 0.00 (2)	0.59 ± 0.31 (7)	1.20 ± 1.19 (2)
	Aransas/Corpus Christi	0.01 ± 0.01 (7)	0.01 ± 0.01 (4)	0.01 ± 0.01 (6)	0.03 ± 0.03 (5)
	Lower Laguna Madre	0.00 ± 0.00 (6)	0.00 ± 0.00 (2)	0.01 ± 0.01 (7)	0.03 ± 0.01 (4)
Kingfish	Galveston	0.01 ± 0.01 (9)	0.03 ± 0.03 (2)	0.05 ± 0.03 (7)	0.01 ± 0.00 (2)
	Aransas/Corpus Christi	0.08 ± 0.06 (7)	0.00 ± 0.00 (4)	0.13 ± 0.10 (6)	0.08 ± 0.06 (5)
	Lower Laguna Madre	0.03 ± 0.03 (6)	0.10 ± 0.04 (2)	0.11 ± 0.06 (7)	0.11 ± 0.03 (4)
Total fish	Galveston	0.97 ± 0.57 (9)	0.43 ± 0.43 (2)	1.92 ± 0.08 (7)	4.61 ± 2.69 (2)
	Aransas/Corpus Christi	0.43 ± 0.15 (7)	0.22 ± 0.08 (4)	1.74 ± 0.21 (6)	3.06 ± 0.85 (5)
	Lower Laguna Madre	0.36 ± 0.16 (6)	0.29 ± 0.15 (2)	0.93 ± 0.38 (7)	0.40 ± 0.08 (4)

Table 10.—Mean catch rate (no./man trip-hour ± 1 SE) of spotted seatrout and total fish by recreational fishermen on party boats in Texas bays during September 1978-August 1979. (Numbers in parentheses represent number of interview days.)

Species	Bay system	Day type	
		Weekday	Weekend
Spotted seatrout	Galveston	0.92 ± 0.10 (3)	0.52 ± 0.27 (3)
	Aransas/Corpus Christi	0.52 ± 0.52 (2)	1.04 ± 0.34 (6)
	Lower Laguna Madre	1.47 ± 0.30 (16)	1.07 ± 0.32 (8)
	All bays	1.30 ± 0.24 (21)	0.97 ± 0.20 (17)
Total fish	Galveston	1.04 ± 0.14 (3)	0.52 ± 0.28 (3)
	Aransas/Corpus Christi	0.67 ± 0.38 (2)	1.04 ± 0.41 (6)
	Lower Laguna Madre	1.62 ± 0.29 (16)	1.16 ± 0.33 (8)
	All bays	1.45 ± 0.23 (21)	1.01 ± 0.21 (17)

Table 11.—Summary of results of three-way analysis of variance of mean catch rates (no./man-hour) of selected species by fishermen on headboats in Texas bays on weekdays and weekends in the summer/fall and winter/spring seasons.

Source of variation	df	Sand seatrout		Atlantic croaker		Kingfish		Total fish	
		Mean square	F	Mean square	F	Mean square	F	Mean square	F
Total	60	0.058		0.011		0.002		0.059	
Seasons	1	0.632	15.906**	0.045	5.327 NS	0.005	2.632 NS	0.915	23.302**
Day types	1	0.045	1.128 NS	0.001	0.175 NS	0.001	0.284 NS	0.007	0.188 NS
Bay systems	2	0.129	3.237 NS	0.057	6.711**	0.002	1.181 NS	0.166	4.221 NS
Seasons × day types	1	0.087	2.185 NS	0.008	0.934 NS	0.000	0.239 NS	0.074	1.894 NS
Seasons × bay systems	2	0.135	3.395 NS	0.044	5.199**	0.000	0.208 NS	0.116	2.941 NS
Day types × bay systems	2	0.059	1.490 NS	0.002	0.235 NS	0.002	0.935 NS	0.030	0.768 NS
Seasons × day types × bay systems	2	0.059	1.478 NS	0.005	0.551 NS	0.000	0.281 NS	0.050	1.264 NS
Error	49	0.040		0.009		0.002		0.039	

**$P < 0.01$
NS = not significant at $P = 0.01$.

Table 12.—Summary of results of two-way analysis of variance of mean catch rates (no./man trip-hour) of spotted seatrout and total fish by fishermen on party boats in Texas bays on weekdays and weekends.

Species	Source of variation	Mean square (df)	F
Spotted seatrout	Total	0.039 (30)	
	Day type	0.472 (1)	17.729**
	Bay system	0.052 (2)	1.965 NS
	Day type × bay system	0.007 (2)	0.256 NS
	Error	0.027 (25)	
Total fish	Total	0.045 (30)	
	Day type	0.580 (1)	19.893**
	Bay system	0.065 (2)	2.241 NS
	Day type × bay system	0.009 (2)	0.299 NS
	Error	0.029 (25)	

**$P < 0.01$.
NS = not significant at $P = 0.01$.

(Wade, 1977). The Florida Gulf coast and Keys charter boat fishery preferred grouper (Serranidae), snapper, king mackerel, billfish (Istiophoridae), and dolphin, *Coryphaena* sp. (Browder et al., 1981). However, Fable et al. (1981) reported that the Florida charter boat fishery landed primarily king mackerel and Atlantic bonito, *Sarda sarda*, during 1970-1979. In North Carolina, king mackerel, dolphin, bluefish, *Pomatomus saltatrix;* yellowfin tuna, *Thunnus albacares;* and white marlin, *Tetrapturus albidus,* were the most important species for charter fishermen (Manooch et al., 1981). The composition of the charter boat landings may thus reflect the distribution of the fishes throughout the Gulf. Fable et al. (1981) suggested that the catch rate for king mackerel was directly related to the water temperature in the preceding winter. Landings may also reflect the preferences of the captains or clients in each area. The importance of considering fishermen preference was noted by Richards (1965) when he concluded that mean catch rates for each species should be calculated based only on fishermen who were successful in catching that species. Additional research should be conducted to determine the importance of motivation, preferences, and experience of the captains and fishermen in explaining fluctuations in the fish stocks.

Fishermen who use charter boats generally have higher catch rates than those fishing without the experience

of a fishing guide. McConnell et al. (1981) found that charter boat fishermen in Rhode Island had higher success rates than those fishing from man-made structures, shore, and private boats. Caillouet and Higman (1978) reported that charter fishermen had higher catch rates because guides had knowledge of fishing areas and methods that exceeded that of the average fisherman. Ditton et al. (1978a) reported that Texas charter captains are experienced charter operators. Texas private Gulf boat fishermen from 15 May-20 November 1979 had lower catch rates for king mackerel (0.01-0.08 fish/man-hour), Spanish mackerel (0.02-0.10 fish/man-hour), and red snapper (<0.01-0.17 fish/man-hour) than did the Gulf charter operators in this study (McEachron and Green, 1982). Bay weekend private boat fishermen during the same period had catch rates that were less than half (0.10-0.47 spotted seatrout/man-hour) the bay charter boat fishermen catch rates. Perhaps because of their experience, Texas charter boat operators are aware of the areas where fish can be caught easily or are knowledgeable of fishes' habits and attempt to place clients where fish are accessible. Graefe (1981) concluded that sport fishermen who fished often for sciaenids were probably more successful at catching fish than those who seldom fished. Additional research is needed to understand fully the influence of fishing experience on catch rates. If the captain is more important than the fishermen in determining the catch rate, the day of the boat trip should not affect catch rate. This study has shown that in Texas there were no differences between catch rates on weekday or weekend for each of the charter boat fisheries except for the bay party boat fishery. No explanation for this difference is readily apparent.

Acknowledgments

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Literature Cited

Browder, J. A., J. C. Davis, and E. Sullivan. 1981. Paying-passenger recreational fisheries of the Florida Gulf coast and Keys. Mar. Fish. Rev. 43(8):12-20.

Bureau of Sport Fisheries and Wildlife. 1972. The 1970 national survey of fishing and hunting. U.S. Fish Wildl. Serv. Resour. Publ. 95, 109 p.

Caillouet, C. W., Jr., and J. B. Higman. 1978. Accuracy of sampling procedures and catch rates in sport fishing. Univ. Miami Sea Grant Program Bull. 1, 25 p.

Cochran, W. G. 1967. Sampling techniques, 3rd ed. John Wiley and Sons, N.Y., 428 p.

Ditton, R. B., and A. R. Graefe. 1978. Recreational fishing use of artificial reefs on the Texas coast. Dep. Rec. Parks, Tex. Agric. Exp. Stn., Tex. A&M Univ., Interagency contract (77-79) 0805, 155 p.

_____, _____, A. J. Fedler, and J. D. Schwartz, 1979. Access to and usage of offshore liberty ship reefs in Texas. Mar. Fish. Rev. 41(9):25-31.

_____, R. N. Jarman, and S. A. Woods. 1978a. An analysis of the charter fishing industry on the Texas Gulf coast. Mar. Fish. Rev. 40(8):1-7.

_____, T. J. Mertens, and P. Schwartz. 1978b. Characteristics, participation and motivation of Texas charterboat fishermen. Mar. Fish. Rev. 40(8):8-13.

Dugas, R., V. Guillory, and M. Fisher. 1979. Oil rigs and offshore sport fishing in Louisiana. Fisheries 4(5):2-10.

Fable, W. A., Jr., H. A. Brusher, L. Trent, and J. Finnegan, Jr. 1981. Possible temperature effects on charter boat catches of king mackerel and other coastal pelagic species in northwest Florida. Mar. Fish. Rev. 43(8):21-26.

Graefe, A. R. 1981. Understanding diverse fishing groups: The case of drum fishermen. *In* H. Clepper (editor), Proc. 6th annu. mar. rec. fish. symp., p. 69-81. Int. Game Fish Assoc., Ft. Lauderdale, Fla.

Hamilton, C. L. 1981. Texas commercial harvest statistics, 1978-79. Tex. Parks Wildl. Dep., Coast. Fish. Branch, Manage. Data Ser. 12, 32 p.

Heffernan, T. L., A. W. Green, L. W. McEachron, M. G. Weixelman, P. C. Hammerschmidt, and R. A. Harrington. 1976. Survey of finfish harvest in selected Texas bays. Tex. Parks Wildl. Dep., Coast. Fish. Branch. Proj. Rep. 2-231-R-1, 116 p.

_____, and R. J. Kemp. 1980. Management of the red drum resource in Texas. *In* R. O. Williams, J. E. Weaver, and F. A. Kalber (editors), Proc. colloq. biol. manage. red drum and seatrout. Gulf States Mar. Fish. Comm. 5:71-80.

Hoese, H. D., and R. H. Moore. 1977. Fishes of the Gulf of Mexico, Texas, Louisiana and adjacent waters. Tex. A&M Univ. Press, Coll. Stn., 327 p.

McConnell, K. E., T. P. Smith, and J. F. Farrell. 1981. Marine sport fishing in Rhode Island, 1978. Univ. R.I. Sea Grant Tech. Rep. 83, 26 p.

McEachron, L. W. 1980. Headboat and charterboat finfish catch statistics for the bays and Gulf waters of Texas, September 1978-August 1979. Tex. Parks Wildl. Dep., Coast Fish. Branch Manage. Data Ser. 10, 38 p.

_____, L. Z. Barrington, M. G. Weixelman, P. Campbell-Hostettler, R. A. Spaw, K. W. Spiller, and J. P. Breuer. 1981. Survey of finfish harvest by sport fishermen in selected Texas bays, September-August 1974-76 and 1979-80. Tex. Parks Wildl. Dep., Coast. Fish. Branch Manage. Data Ser. 24, 221 p.

_____, and A. W. Green. 1982. Weekend sport boat fishermen finfish catch statistics for Texas Bay systems, May 1974-May 1981. Tex. Parks Wildl. Dep., Coast. Fish. Branch Manage. Data Ser. 35, 123 p.

Manooch, C. S., III, L. E. Abbas, and J. L. Ross. 1981. A biological and economic analysis of the North Carolina charter boat fishery. Mar. Fish. Rev. 43(8):1-11.

NMFS. 1980. Marine recreational fishery statistics survey, Atlantic and Gulf coasts, 1979. U.S. Dep. Commer., NOAA, Natl. Mar. Fish. Serv., Curr. Fish. Stat. 8063, 139 p.

Overall, J. E., and D. K. Spiegel. 1969. Concerning least square analysis of experimental data. Psychol. Bull. 72(5):311-322.

Richards, C. E. 1965. Availability patterns of marine fishes caught by charter boats operating off Virginia's eastern shore 1955-1962. Chesapeake Sci. 6(2):96-108.

Robins, R. C., R. M. Bailey, C. E. Bond, J. R. Brocker, E. A. Lachner, R. N. Lea, and W. B. Scott. 1980. A list of common and scientific names of fishes from the United States and Canada. 4th ed. Am. Fish. Soc. Spec. Publ. 12, 174 p.

Trent, L. 1976. Evaluation of the marine recreational fisheries in the northwestern Gulf of Mexico from Port Aransas to Port Isabel, Texas, 1975-76. *In* Environmental studies of the south Texas outer continental shelf, 1975. Addendum to: Vol. I. Plankton and fisheries. NOAA Final Rep. to Bur. Land Manage. Interagency Agreement No. 08550-IA5-19, 236 p.

Vetter, R. D., and O. A. Roels. 1977. An assessment of the sport fishery on artificial "liberty ship" reefs off Port Aransas, Texas. Interagency contract (76-77)-2149. Univ. Tex. Mar. Sci. Inst., Port Aransas, 28 p.

Wade, W. C. 1977. Survey of the Alabama marine recreational fishery. Ala. Mar. Rec. Bull. 12, 30 p.

Woods, S. A., and R. B. Ditton. 1979. Texas charter fishing—bay and Gulf. Tex. A&M Univ., Sea Grant Coll. Program TAMU-SG-80-504, 3 p.

Seafood Consumption and Exports Are Up in Hawaii

Seafood consumption and exports of locally caught fresh fish are apparently rising in Hawaii, according to Richard S. Shomura, Director of the NMFS Southwest Fisheries Center's Honolulu Laboratory. The laboratory has completed an intensive survey of 105 wholesale fish dealers in Hawaii which showed that: 1) Total fish sales are $77 million (30.6 million pounds) at the wholesale level; 2) 45 percent of the fish is locally produced, whereas 30 percent is imported from the mainland and 25 percent is from other areas; 3) fish imports amount to $28.7 million, of which $2.4 million is fresh fish and $21.2 million is frozen seafood (lobster, shrimp, mahimahi, etc.). The rest comes in cans, bottles, and other processed forms; 4) exports of local fish, excluding canned tuna, amount to $5.8 million—twelve firms are pioneering the export market including yellowfin and bigeye tunas destined for the sushi bars of Japan, the U.S. west coast, and even the midwest; bottom fish for restaurants from New York to Dallas; and spiny lobsters for Los Angeles and the international market; 5) seafood consumption in Hawaii is estimated to be 24 pounds per person, including the tourist sector, compared with the national average of 13 pounds per person (this consumption rate is up from the Honolulu Laboratory's previous estimate for Hawaii of 20.5 pounds per person in 1977).

Shomura commented that Hawaii's seafood marketing system is going through a transition period where the traditional fish dealers are either being transformed into multifaceted seafood wholesalers or are being edged out of the wholesale market entirely. "The variety of seafood in the markets is as great as ever," Shomura said, "but the competition for good, fresh seafood is growing." The price of ono (wahoo) has increased over 100 percent in the past 5 years because it has become a prime item on restaurant menus. Similar possibilities exist for other species, such as local mahimahi and opakapaka (pink snapper). These species are also being exported from Hawaii so relatively high prices are likely to continue in the local marketplace.

The survey findings were reported by the Laboratory's Industry Economist Samuel G. Pooley and Computer Programmer James C. Cooper in an informal report, "Total seafood volume in Hawaii's wholesale fish markets." The Honolulu Laboratory is currently conducting a survey of the retail seafood market to provide the first comprehensive picture of seafood consumption and marketing in Hawaii. Results from the retail survey are expected by mid-1983.

United States, ROK Sign New Fisheries Agreement

On 26 July representatives of the United States of America and of the Republic of Korea signed a new agreement relating to fishing activities of Korea off the coasts of the United States. The Governing International Fishery Agreement (GIFA) sets out the arrangements between the countries which will govern fishing by Korean vessels within the fishery conservation zone of the United States. It renews the initial GIFA signed in 1977 and brings it into conformity as amended by the American Fisheries Promotion Act ("Breaux Bill"). The agreement was to come into force after the completion of internal procedures by both governments.

The signing of this agreement took place in Washington, D.C. Byong Hion Lew, Korean Ambassador to the United States, signed for the Republic of Korea. James Malone, Ambassador of the United States for Oceans and International Environmental and Scientific Affairs, signed for the United States. Both delegations expressed their satisfaction with the new accord, and the hope that it will strengthen cooperation between the Republic of Korea and the United States. (Source: U.S. Department of State.)

SEA SCALLOP IMPORTS SEIZED

Special agents of the National Marine Fisheries Service intercepted shipments of undersized Atlantic sea scallops from Canada which entered the United States last fall without required certification. Possession of such scallops is a violation of federal resource conservation regulations.

Sea scallop shipments are inspected at the U.S. border to ensure that they are accompanied by a certificate issued by the Canadian government. The certificate must specify that the scallops were harvested in compliance with Canadian fishery conservation regulations which are substantially consistent with U.S. regulations.

Last fall, a truck carrying scallops without proper certification ignored the warning of U.S. Customs Inspectors to return to Canada or face apprehension by National Marine Fisheries Service Special Agents. After entering the United States, the shipment of scallops was divided into two lots and trucked to Atlanta, Ga., and Dallas, Tex. NMFS Special Agents pursued the trucks to their destinations and seized 76,000 pounds of sublegal sea scallops valued at over $350,000. The value of the scallops was confiscated for failure to comply with either the certification agreement or U.S. sea scallop meat size standards.

Regulations implementing the sea scallop management program in the United States were established by emergency action of the Secretary of Commerce on 15 May 1982. Permanent regulations were effective 13 August 1982. The sea scallop resource of the Northwest Atlantic supports a fishery valued in 1981 at over $111 million to domestic fishermen. Approximately 45 percent of domestic sea scallop consumption is supplied by imports from Canada.

Inspection of Salmon Products for a Quality Level Designation

Although quality designations such as #1 salmon have long been used by the industry, there are no industry-wide recognized standards or specifications by which to assess compliance with such designations. The inconsistencies that currently exist in industry relative to these quality designations have resulted in material previously inspected and certified by NMFS being ultimately rejected by the buyer because of a different perception as to what constitutes a specific quality designation.

To provide industry with the desired latitude that often exists in different buyer/seller relationships, while at the same time enabling NMFS to fulfill its responsibilities relative to the inspection and certification of fishery products, the following policy has been adopted by the Agency relative to the inspection of salmon products:

The NMFS Fishery Products Inspectors will inspect product purporting to be of a specific quality level only if written detailed inspectional criteria are provided to the Government inspector. These criteria may be:

1) A written company specification defining the designated quality level;

2) criteria specified on a purchasing agreement; or

3) the technical requirements delineated in the applicable, established U.S. Standards for Grades of Fishery Products.

In any case, the criteria used to evaluate the designated quality level shall either be stated on the certificate or reference made to an attached document containing such criteria. Source: NMFS Seafood Research, Inspection, and Consumer Services Division.

Thawing Fish Before Processing Maintains Functional Properties

Study by the Utilization Research Division, NMFS Northwest and Alaska Fisheries Center, Seattle, Wash., of the effects of freezing and storage of Alaska pollock and cod have shown the importance of proper thawing prior to processing the flesh for quality evaluation. For example, if the fish flesh is ground while hard frozen (at −10°F to −20°F), a large loss of the functional properties occurs. These properties include water-holding capacity, emulsifying capacity, and elasticity of the flesh and are important quality indices for fish used in fabricated foods such as imitation crab or scallop meats. If the frozen fish muscle is first thawed prior to grinding by holding at 40°F in a refrigerator, then little or no change in the functional properties occurs.

The cause of this loss of functionality in muscle that has been ground while frozen is not understood. Currently, some effort is being made to study these changes because we believe this will result in an improved understanding of the effect of various process treatments on the functionality of fish flesh.

The immediate benefit of this work is the demonstrated need to thaw frozen fish flesh prior to grinding or mincing for use in processed and fabricated foods. This practice of thawing is also essential for laboratory and quality control tests on frozen fish. *Herman Groninger*

SPECIAL TOP NOTICE

The U.S. Department of Commerce has prepared a report which summarizes the prequalification announcements reported by the major purchasing agencies of the Government of Japan. These have been advertised through the "Trade Opportunities Program" (TOP) in recent months. The report includes names and addresses, products to be purchased, and Japanese Language letters prepared by the U.S. Embassy in Tokyo which U.S. firms can use to request prequalification materials and bid documents. The report is available at all Commerce district offices and from the U.S. Department of Commerce, Office of Japan/ITA, Washington, DC 20230; Telephone (202) 377-2425.

Sample Shrimp Catches From Tortugas Cruises

The Galveston Laboratory of the National Marine Fisheries Service, Southeast Fisheries Center, is in its second phase of studies of the Tortugas shrimp fishery area. The first cruise of the second phase was completed aboard the M/V *Miss Virginia* in September 1982. The following information, obtained during the September cruise, is a summary of shrimp catch rates from sampling stations located outside the Tortugas sanctuary. Catch rates are for a 1-hour tow with a single 40-foot flat trawl, in heads-off pounds.

NMFS Sampling Station	Sept. lb/h
36 Lat. 25°09'N, Long. 81°53'W	0.3
67 Lat. 24°59'N, Long. 82°05'W	13.5
82 Lat. 24°58'N, Long. 82°06'W	17.6
97 Lat. 24°54'N, Long. 82°06'W	17.5
122 Lat. 24°45'N, Long. 82°10'W	9.8
145 Lat. 25°07'N, Long. 82°19'W	10.2
156 Lat. 25°02'N, Long. 82°13'W	12.5
181 Lat. 24°56'N, Long. 82°09'W	15.7
199 Lat. 24°52'N, Long. 81°11'W	9.6
231 Lat. 24°41'N, Long. 81°33'W	2.6
258 Lat. 25°07'N, Long. 82°28'W	1.9
280 Lat. 24°59'N, Long. 82°24'W	5.6
307 Lat. 24°53'N, Long. 82°24'W	6.5
326 Lat. 24°46'N, Long. 82°31'W	5.7
333 Lat. 24°47'N, Long. 82°48'W	5.8
362 Lat. 25°06'N, Long. 82°46'W	2.0
369 Lat. 25°06'N, Long. 82°58'W	0.8
391 Lat. 25°01'N, Long. 82°58'W	0.0
433 Lat. 24°55'N, Long. 82°58'W	1.1
454 Lat. 24°49'N, Long. 82°48'W	4.6

Japanese Joint Fishing Ventures Stabilize

In 1977, 175 joint fishing ventures with the participation of Japanese capital were functioning around the world. In 1978 there were 192, in 1979—203, and in 1980—215. In 1981, 193 joint ventures with the participation of Japanese capital were operating in 47 nations (Table 1, 2).

The 1981 total capital value of the 193 ventures was $146.7 million, including the Japanese investment of $98.2 million (66.9 percent). In 1981, the capital value of these joint ventures in Central and South America was $51.5 million, which is 73 percent more than in 1980. The Japanese investment in these ventures was $41.1 million, which is 70 percent more than in 1980.

The 1981 capital value of joint ventures with Japanese participation in Asia and Oceania was $55.9 million, which is 13 percent less than in 1980. The Japanese investment in 1981 was $31.6 million, which is 17 percent less than in 1980. The 1981 capital value of joint ventures with Japanese participation in Africa was $6.8 million, which is five percent less than in 1980. Japanese investment was $2.65 million, which is 13 percent less than in 1980.

The capital value of joint ventures with Japanese participation in Europe was $388,000, which is 86 percent less than in 1980. The Japanese investment was $156,000, which is 91 percent less than in 1980. The capital value of the joint ventures in North America was $32 million, or 30 percent less than in 1980. The Japanese investment there decreased by 16 percent.

Below are figures of the average Japanese investment in a joint venture, by activity. Thus the average of total Japanese investments in a joint venture company was $494,143 which is 25 percent (or $99,100) more than in 1979.

Activity	*$1,000*
Trawling	$1,257
Skipjack tuna harvest	456
Whaling	786
Other harvests	113
Aquaculture	121
Refrigeration operations	337
Fish processing	389
Average	494

From April 1980 to March 1981, six new Japanese joint ventures began functioning. Among them, the largest joint venture was formed by the Japanese firm Nihon Suisan in Argentina. This venture conducts trawling for bottom species such as hake and squid. The Japanese firm Hokoku Suisan formed a joint venture in Venezuela for the catching and processing of shrimp. (The vessels of this joint venture can purchase fuel at a reduced price, which is one-tenth of the standard price of fuel in the countries of Latin America.) The four other joint ventures, which are relatively small, are located in New Guinea, Indonesia, New Caledonia, and New Zealand.

Lately, Japanese fishing firms, which are participating in the formation of joint ventures abroad, are analyzing their activities with the aim of maximizing profits. According to fish industry officials in Japan, for the next few years the number of joint Japanese fishing ventures will remain at the 1981 level or diminish somewhat. (Source: LSB 82-6.)

Table 1.—Japanese joint ventures, by region, capital value, and Japanese investment in 1981, and the percentage change from 1980.

Region	Capital value[1] of joint ventures	Change from 1980	Japanese investment[1] in joint ventures	Change from 1980
Cent. and S. America	$51.5	+73%	$41.1	+70%
Asia and Oceania	$55.9	-13%	$31.6	-17%
Africa	$ 6.8	- 5%	$ 2.65	-13%
Middle East	N/A	N/A	N/A	N/A
Europe	$0.39	-86%	$ 0.16	-91%
N. America	$32	-30%	N/A	-16%

[1]Value listed in millions of dollars.

Table 2.—Japanese joint ventures in 1981, by region and activity.

Region	Number of joint ventures								
	Shrimping	Trawling	Skipjack tuna harvest	Whaling	Other harvest	Aquaculture	Refrig. operations	Fish processing	Total
Cent. and S. America	4	9	1	1	3	1	4	2	25
Asia and Oceania	18	3	6	0	18	29	12	18	104
Africa	3	6	3	0	0	0	3	1	16
Middle and Far East	0	0	0	0	0	0	0	1	1
Europe	0	1	0	0	0	0	0	0	1
N. America	0	0	0	1	5	1	1	38	46
Total	25	19	10	2	26	31	20	60	193

Latin American Tuna Exports to U.S. Down

Despite the rapid development of the tuna fisheries in several Latin American countries, U.S. tuna imports from that region have declined sharply since 1979. Shipments from the region totaled only 37,600 metric tons (t) of tuna in 1981, a decline of 33 percent from the 56,500 t imported in 1980 and a decline of over 50 percent from the record 76,700 t imported in 1979 (Table 1). The value of tuna imported from Latin America has also declined (Table 2).

The main reason for reduced tuna exports has been the imposition of tuna and tuna product embargoes by the United States on countries which seized U.S. tuna purse seiners in jurisdictions it does not recognize. Embargoes were in force on Ecuador, Mexico, and Peru, as of mid-1982. A similar embargo on Costa Rica was removed in February 1982. Two of the countries affected, Ecuador and Mexico, were formerly major suppliers of tuna to U.S. canneries.

Latin America now supplies only a small portion of U.S. tuna imports. The United States imported about 37,600 t from Latin America in 1981, only 12 percent of total U.S. tuna imports (Fig. 1). In previous years, Latin American countries supplied a greater

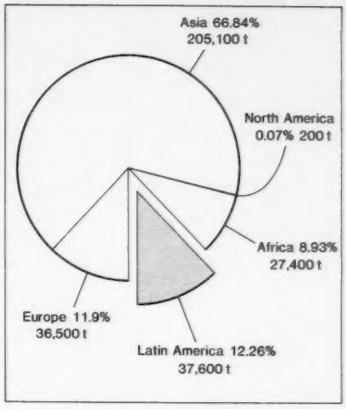

Figure 1.—United States tuna imports, 1981.

Table 1.—Latin American tuna exports to the United States, by quantity, 1977-81.

Country	Exports (t) 1977	1978	1979	1980	1981
Caribbean					
Bahamas	2,700.9	529.7	—	—	—
Barbados	—	—	—	—	68.0
Bermuda	7,199.7	6,300.7	4,380.5	—	445.7
Cayman Islands	—	—	—	294.8	1,908.9
Cuba	—	—	—	—	—
Dominican Republic	244.9	—	—	—	19.1
French West Indies	—	—	59.2	14.7	56.8
Grenada	—	—	—	—	—
Haiti	—	—	—	—	—
Jamaica	—	—	—	—	—
Montserrat	—	—	—	—	—
Netherlands Antilles	5,666.3	7,670.9	11,753.9	11,837.1	2,334.5
Trinidad-Tobago	315.9	—	12.5	242.2	508.2
Subtotal[1]	16,127.7	14,501.3	16,206.1	12,388.8	5,341.2
Central America					
Belize	—	—	—	—	—
Canal Zone	789.3	—	—	—	—
Costa Rica	226.8	573.2	558.0	450.0	—
El Salvador	—	—	—	—	—
Guatemala	—	—	—	—	—
Honduras	—	4.7	—	—	—
Mexico	11,611.0	17,853.3	10,038.1	4,730.5	—
Nicaragua	775.8	2,988.4	846.0	—	—
Panama	13,616.9	14,519.9	25,685.3	16,201.7	14,297.3
Subtotal[1]	27,019.8	35,939.5	37,127.4	21,382.2	14,297.3
South America					
Argentina	—	—	—	—	12.2
Bolivia	—	—	—	—	—
Brazil	2.5	708.2	394.8	4,743.7	6,286.4
Chile	—	—	—	3.7	25.4
Colombia	—	—	—	—	—
Ecuador	11,202.7	12,535.5	17,134.1	11,845.2	—
French Guiana	—	—	—	—	—
Guyana	—	—	—	—	—
Paraguay	—	—	—	—	—
Peru	99.2	40.6	86.6	510.4	23.4
Suriname	—	—	—	—	—
Uruguay	316.9	2,654.2	710.7	1,602.9	1,639.1
Venezuela	2,540.2	9,324.4	5,066.7	4,062.0	9,970.7
Subtotal[1]	14,161.5	25,262.9	23,392.9	22,767.9	17,957.2
Grand total	57,309.0	75,703.7	76,726.4	56,538.9	37,595.7

[1]Totals may not agree due to rounding.
Source: U.S. Department of Commerce, Bureau of the Census.

Table 2.—Latin American tuna exports to the United States, by value, 1977-81.

Country	Export value (US$1,000) 1977	1978	1979	1980	1981
Caribbean					
Bahamas	775.2	175.2	—	—	—
Barbados	—	—	—	—	222.2
Bermuda	2,224.9	1,599.4	1,337.3	—	520.6
Cayman Islands	—	—	—	277.5	2,279.2
Cuba	—	—	—	—	—
Dominican Republic	199.7	—	—	—	35.2
French West Indies	—	—	97.3	53.0	124.2
Grenada	—	—	—	—	—
Haiti	—	—	—	—	—
Jamaica	—	—	—	—	—
Montserrat	—	—	—	—	—
Netherlands Antilles	4,319.7	7,823.9	10,072.5	14,394.8	4,576.0
Trinidad-Tobago	497.6	—	21.7	523.0	710.3
Subtotal[1]	8,017.3	9,598.5	11,528.8	15,248.3	8,467.7
Central America					
Belize	—	—	—	—	—
Canal Zone	709.1	—	—	—	—
Costa Rica	190.0	499.9	464.4	382.5	—
El Salvador	—	—	—	—	—
Guatemala	—	—	—	—	—
Honduras	—	5.6	—	—	—
Mexico	8,136.5	16,221.7	9,976.3	5,110.9	—
Nicaragua	250.4	1,598.4	715.8	—	—
Panama	10,366.9	12,605.9	23,410.3	18,799.1	18,270.8
Subtotal[1]	19,652.9	30,931.5	34,566.8	24,292.5	18,270.8
South America					
Argentina	—	—	—	—	26.8
Bolivia	—	—	—	—	—
Brazil	7.9	448.3	291.4	5,204.9	7,440.8
Chile	—	—	—	4.4	35.6
Colombia	—	—	—	—	—
Ecuador	9,853.7	7,941.9	12,186.3	11,136.4	—
French Guiana	—	—	—	—	—
Guyana	—	—	—	—	—
Paraguay	—	—	—	—	—
Peru	132.9	53.3	107.4	777.6	19.2
Suriname	—	—	—	—	—
Uruguay	428.8	4,433.9	985.1	3,382.9	2,749.4
Venezuela	1,740.5	7,858.7	2,711.3	3,068.7	12,793.5
Subtotal[1]	12,163.8	20,736.1	16,281.5	23,574.9	23,065.3
Grand total	39,834.0	61,266.1	62,377.1	63,116.7	49,803.8

[1]Totals may not agree due to rounding.
Source: U.S. Department of Commerce, Bureau of the Census.

Table 3.—U.S. tuna imports by area, 1977-81.

Area	Exports (1,000 t)				
	1977	1978	1979	1980	1981
Asia	164.9	205.7	198.4	201.5	205.1
Latin America	57.3	75.7	76.7	56.5	37.6
Europe	28.1	17.9	11.3	17.7	36.5
Africa	13.0	33.3	27.0	23.2	27.4
North America	1.2	0.1	0.1	0.1	0.2
Total[1]	264.5	332.7	313.5	299.0	306.9

[1]Totals may not agree due to rounding. Note: Totals may not agree with tuna import data published in "Fisheries of the United States" as Bureau of the Census data does not include shipments from American Samoa. Source: U.S. Department of Commerce, Bureau of the Census.

Table 4.—Latin American tuna exports to the United States, 1977-81.

Product	Exports (1,000 t)				
	1977	1978	1979	1980	1981
Fresh or frozen	56.8	75.4	76.6	56.0	37.6
Canned	0.5	0.3	0.1	0.5	negl.
Total	57.3	75.7	76.7	56.5	37.6

Source: U.S. Department of Commerce, Bureau of the Census.

proportion of U.S. tuna imports. The 75,700 t imported from Latin America in 1978, for example, was over 20 percent of all U.S. tuna imports (Table 3).

The major Latin American suppliers of tuna to the U.S. market in 1981 were Panama, Venezuela, and Brazil. The United States has imported tuna from Panama and Venezuela for several years. Brazil has recently begun to develop a tuna fishery, and as a result, the United States began to import significant quantities in 1980. The United States also imports tuna from several other Latin American countries (i.e., the Netherlands Antilles and the Cayman Islands), but this tuna is mostly taken by foreign vessels registered in those countries for a variety of tax and legal reasons. The tuna is mostly caught in the eastern Pacific and transshipped in Panama.

The United States imports primarily frozen tuna which is then packaged at canneries in southern California and in Puerto Rico. Almost all of the 37,600 t of tuna imported from Latin America in 1981 was shipped frozen (Table 4). The United States imported only negligible quantities of canned tuna from Latin America in 1981, primarily because embargoes were in place on the major Latin American tuna canning countries, Mexico and Ecuador. Frozen tuna enters the United States duty free, while tariff duties, especially the 35 percent duty on tuna canned in oil, tend to limit imports of canned tuna from Latin American as well as from other exporting countries.

The Latin American Fishery Export Market

The Latin American region is the world's smallest export market for fishery products (Fig. 1). Most Latin American countries import only small quantities of fishery products and several of the major countries in the region have initiated ambitious fishery development projects which will further reduce the demand for imported seafood.

In 1980, Latin American countries imported 0.4 million metric tons (t) of fishery products, about 4 percent of the 9.2 million t traded worldwide (Table 1). The value of Latin American fishery imports was an even smaller proportion of the world fisheries trade, amounting to only 2 percent of all imports (Table 1).

Most of the region's imports go to only five countries: Brazil, Colombia, Cuba, Mexico, and the Dominican Republic. These five countries imported 281,000 t, or 77 percent of all fishery products imported by Latin America in 1980.

Latin American fishery imports declined sharply in 1980, totaling only 370,000 t, almost a 10 percent decline from the 400,000 t imported in 1979. This contrasts with an 18 percent growth rate for each of the previous two years (Tables 2, 3). The actual dollar value of imports did not change from 1979 to 1980, but when inflation is accounted for, the real value in constant dollars declined by over 10 percent.

Brazil

Brazil is Latin America's leading importer of fishery products (Figure 2). Brazil imported nearly $90 million worth of seafood in 1980, mostly salted cod (Bacalao) from Scandinavia. In an attempt to reduce Brazil's large trade deficit, the government is trying to limit imports by maintaining high

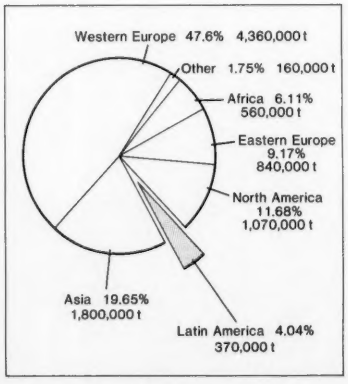
Western Europe 47.6% 4,360,000 t
Other 1.75% 160,000 t
Africa 6.11% 560,000 t
Eastern Europe 9.17% 840,000 t
North America 11.68% 1,070,000 t
Asia 19.65% 1,800,000 t
Latin America 4.04% 370,000 t

Figure 1.—World fishery imports by continent, 1980.

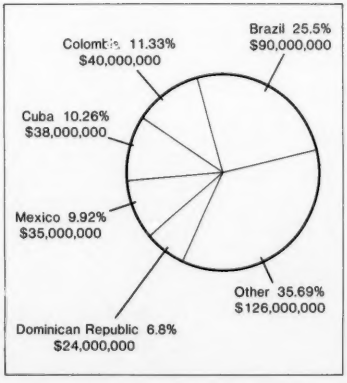

Figure 2.—Latin American fishery imports by country and value, 1980.

Table 1.—World fishery imports by area, quantity, and value, 1980.

Area	Quantity		Value	
	1,000 t	Percent	Million dollars	Percent
Western Europe	4,360.1	47	6,702.5	44
Asia	1,844.4	20	4,246.1	28
North America	1,068.0	12	2,933.2	19
Eastern Europe	840.3	9	447.0	3
Africa	559.3	6	464.8	3
Latin America	366.8	4	353.0	2
Other	160.2	2	146.8	1
Total	9,198.9	100	15,293.5	100

[1]Totals may not agree due to rounding.
Source: FAO "Yearbook of Fishery Statistics," 1980.

tariffs and other trade barriers on most fishery products, while promoting domestic production with an aggressive fisheries development program. Fishery imports peaked in 1979, declined by 16 percent in 1980, and preliminary 1981 data suggest that they have continued to decline.

Colombia

Colombia is Latin America's second leading importer of fishery products, especially fish oil for industrial purposes. Current statistical data on Colombian imports is unavailable, but some observers believe that there is good potential for expanded shipments of low-cost fish for the country's rapidly expanding population.

Cuba

Cuban fishery imports have remained relatively constant in both value and quantity. The imports are

Table 2.—The value of Latin American fishery product imports, 1977-80.

Country or dependency	Value (US$1,000,000)				Major commodity
	1977	1978	1979	1980	
Caribbean					
Antigua	0.8F	0.8F	0.8F	0.8F	Fish: Dried or salted
Bahamas	1.6	1.6F	1.6F	1.6F	Fish: Canned
Barbados	1.9	1.9F	1.9F	1.9F	Fish: Canned
Bermuda	3.0	3.3	3.8	3.8F	Shellfish
Cayman Isl.	0.2F	0.2F	0.2F	0.2F	Fish: Canned
Cuba	39.0	31.3	38.1	38.1F	Fish: Fresh or frozen
Dominica	0.5	0.6	0.6F	0.6F	Fish: Dried or salted
Dom. Rep.	14.4	14.5	19.6	23.7	Fish: Dried or salted
Grenada	0.5F	0.5F	0.5F	0.5F	Fish: Dried or salted
Guadeloupe	4.8	5.7	7.1	8.1	Fish: Dried or salted
Haiti	1.7	1.7F	1.7F	1.7F	Fish: Dried or salted
Jamaica	11.9	18.0	17.8F	17.7	Fish: Canned
Martinique	7.8	10.7	12.9	12.3	Fish: Dried or salted
Montserrat	NA	NA	NA	NA	NA
Neth. Ant.	4.7	4.7F	4.7F	4.7F	Fish: Fresh or frozen
Puerto Rico	NA	0.2	0.2	0.2	NA
St. Kitts	0.3	0.3F	0.4	0.4F	Fish: Dried or salted
St. Lucia	0.7	0.8	0.8F	0.8F	Fish: Dried or salted
St. Vincent	0.4	0.4	0.4F	0.4F	Fish: Dried or salted
Trinidad-Tobago	4.6	7.6	7.7	10.4	Fish: Dried or salted
Turks and Caicos	negl.	negl.	negl.	negl.	NA
Subtotal[1]	98.8	104.8	120.8	127.9	
Central America					
Belize	0.3	0.4	0.4F	0.4F	Fish: Canned
Costa Rica	1.5	1.5	2.7	2.7F	Fish meal
El Salvador	2.4	2.3	2.3F	2.3F	Fish: Canned
Guatemala	1.2F	1.2F	1.2F	1.2F	Fish: Canned
Honduras	1.5	1.1	1.4	2.0	Fish: Canned
Mexico	12.0	20.5	29.7	35.3	Fish: Fresh or frozen
Nicaragua	1.6	0.9	0.7	1.4	Fish: Canned
Panama	2.6	3.6	4.9F	4.9F	Fish: Canned
Subtotal[1]	23.1	31.5	43.3	50.2	
South America					
Argentina	6.9	10.0	10.0F	10.0F	Fish: Fresh or frozen
Bolivia	2.7	3.9	1.7	1.7F	Fish: Canned
Brazil	54.2	71.5	106.5	89.6	Fish: Dried or salted
Chile	1.5	2.4	2.4F	2.4F	Fish: Canned
Colombia	27.9	39.7	39.7F	39.7F	Fish: Canned
Ecuador	negl.	negl.	negl.	negl.	Fish oil
Fr. Guiana	3.0	3.4	6.7	12.0	Shellfish
Guyana	negl.	negl.	negl.	negl.	Shellfish: Canned
Paraguay	NA	NA	NA	NA	NA
Peru	0.4	0.4F	0.4F	0.4F	Fish: Canned
Suriname	1.7F	1.7F	1.7F	1.7F	Fish: Canned
Uruguay	0.8	1.0	1.0F	1.0F	Fish oil
Venezuela	11.0	19.9	20.7	16.5	Fish: Canned
Subtotal[1]	110.0	153.9	190.6	174.9	
Grand total	231.9	290.2	354.7	353.0	

[1]Totals may not agree due to rounding.
NA = not available; negl. = negligible; F = FAO estimate. Source: FAO "Yearbook of Fishery Statistics," 1980.

Table 3.—Latin American fishery product imports, 1977-80.

Country or dependency	Imports (1,000 t)				Major commodity
	1977	1978	1979	1980	
Caribbean					
Antigua	0.6F	0.6F	0.6F	0.6F	Fish: Dried or salted
Bahamas	0.5F	0.5F	0.5F	0.5F	Fish: Canned
Barbados	1.5	1.5F	1.5F	1.5F	Fish: Canned
Bermuda	0.8	0.9	1.4	1.4F	Shellfish
Cayman Isl.	negl.	negl.	negl.	negl.	Fish: Canned
Cuba	77.4	89.6	91.4	91.4F	Fish meal
Dominica	0.8	0.4	0.4F	0.4F	Fish: Dried or salted
Dom. Rep.	13.6	12.0	14.8	17.4	Fish: Canned
Grenada	0.7F	0.7F	0.7F	0.7F	Fish: Dried or salted
Guadeloupe	2.6	2.7	2.8	2.9	Fish: Dried or salted
Haiti	2.4	2.4F	2.4F	2.4F	Fish: Canned
Jamaica	11.6	15.3	19.2F	15.4	Fish: Fresh or frozen
Martinique	4.6	4.9	5.2	4.5	Fish: Dried or salted
Montserrat	NA	NA	NA	NA	NA
Neth. Ant.	2.2	2.2F	2.2F	2.2F	Fish: Fresh or frozen
Puerto Rico	NA	0.2	0.2	0.2	NA
St. Kitts	0.2	0.2F	0.2F	0.2F	Fish: Dried or salted
St. Lucia	0.3	0.4	0.4F	0.4F	Fish: Dried or salted
St. Vincent	0.3	0.3	0.3F	0.3F	Fish: Dried or salted
Trinidad-Tobago	2.7	4.7	3.6	4.3	Fish: Dried or salted
Turks and Caicos	negl.	negl.	negl.	negl.	NA
Subtotal[1]	122.8	139.5	147.8	146.7	
Central America					
Belize	0.2	0.2	0.2F	0.2F	Fish: Canned
Costa Rica	2.6	1.9	4.0	4.0F	Fish meal
El Salvador	2.0	2.1	2.1F	2.1F	Fish: Canned
Guatemala	1.4F	1.4F	1.4F	1.4F	Fish: Canned
Honduras	1.5	1.0	1.2	2.0	Fish: Canned
Mexico	18.7	32.9	55.4	41.0	Fish meal
Nicaragua	2.0	0.9	0.4	0.7	Fish: Canned
Panama	1.6	2.1	2.8F	2.8F	Fish: Canned
Subtotal[1]	30.0	42.5	67.5	54.2	
South America					
Argentina	9.7	9.3	9.3F	9.3F	Fish: Fresh or frozen
Bolivia	4.7	7.1	3.3	3.3F	Fish: Canned
Brazil	64.7	65.9	94.8	70.7	Fish: Fresh or frozen
Chile	0.9F	1.8	1.8F	1.8F	Fish: Canned
Colombia	46.5	60.9	60.9F	60.9F	Fish oil
Ecuador	negl.	negl.	negl.	negl.	Fish oil
Fr. Guiana	1.7	1.6	2.8	3.3	Shellfish
Guyana	negl.	negl.	negl.	negl.	Shellfish: Canned
Paraguay	NA	NA	NA	NA	NA
Peru	0.3	0.3	0.3	0.3	Fish: Canned
Suriname	2.0F	2.0F	2.0F	2.0F	Fish: Canned
Uruguay	0.7	1.0	1.0F	1.0F	Fish: Canned
Venezuela	5.5	14.1	12.6	13.4	Fish: Canned
Subtotal[1]	136.6	164.0	188.9	165.9	
Grand total	289.4	346.0	404.2	366.8	

[1]Totals may not agree due to rounding.
NA = not available; negl. = negligible; F = FAO estimate. Source: FAO "Yearbook of Fishery Statistics," 1980.

primarily low-cost frozen fish and fish meal.

Mexico

Mexico imported $35 million worth of fishery products in 1980, an increase of 16 percent from the $30 million imported in 1979. The quantity of imports, however, declined by 25 percent during the same period. These divergent trends are the result of changes in the composition of Mexico's imports. Mexico is rapidly developing a domestic fish meal industry. As a result, the country has had to import less fish meal, a low cost commodity, but has increased imports of more costly edible commodities. Julio Berdegue, President of Mexico's National Chamber of the Fishing Industry, estimates that Mexico will be self-sufficient in fish meal production by 1983. Some U.S. exporters report a strong market in Mexico for many edible seafood products. Mexican imports of edible commodities in the future, however, will be limited by the country's aggressive fisheries development program and various import restrictions designed to assist the domestic fishing industry.

Dominican Republic

The Dominican Republic imported $24.7 million worth of fishery products in 1980, a 25 percent increase over 1979 shipments. Dominican importers have significantly increased fish purchases since 1979, when an outbreak of African swine fever forced the the slaughter of the country's pig population, a major source of protein for the domestic market. Canned fish accounted for most of the increase in 1980 imports. (Source: IFR-82/100.)

Note: Unless otherwise credited, material in this section is from either the Foreign Fishery Information Releases (FFIR) compiled by Sunee C. Sonu, Foreign Reporting Branch, Fishery Development Division, Southwest Region, National Marine Fisheries Service, NOAA, Terminal Island, CA 90731, or the International Fishery Releases (IFR) or Language Services Biweekly (LSB) reports produced by the Office of International Fisheries Affairs, National Marine Fisheries Service, NOAA, Washington, DC 20235.

Latin American Hake Exports to U.S. Decline

Latin American countries developed hake fisheries in the mid-1970's to supply groundfish to the United States and western Europe. Most of the hake is exported as frozen blocks. Declining cod catches in several countries had created as strong demand for these Latin American exports.

Hake block shipments to the United States reached a record high of 18,000 metric tons (t), worth $24 million, in 1979 (Table 1), but have declined since then. Rising costs and government exchange rate controls in Argentina caused many exporters to increase their prices. As a result, importers in the United States have turned to other suppliers.

The expansion of cod fisheries in Canada and Iceland have provided alternatives for U.S. importers. In 1981, shipments of hake from Latin America to the United States declined to only 11,100 t, worth $16.7 million. The decline in shipments from Argentina has been particularly sharp, and Uruguay actually replaced Argentina as the principal hake supplier to the U.S. market in 1981. (Source: IFR-82/73.)

Table 1.—Latin American exports of hake blocks to the United States, by quantity and value, 1975-81.

	Exports (1,000 t)							Export value ($1,000,000)						
Country	1975	1976	1977	1978	1979	1980	1981	1975	1976	1977	1978	1979	1980	1981
Argentina	1.4	4.8	6.6	11.3	11.9	6.8	4.6	0.9	3.3	6.7	13.5	16.4	10.3	6.9
Brazil	negl.	—	—	negl.	0.1	—	—	negl.	—	—	negl.	0.1	—	—
Chile	—	—	—	0.2	0.2	0.3	1.2	—	—	—	0.2	0.2	0.4	1.7
Peru	0.6	0.4	—	0.2	0.3	1.2	negl.	0.2	0.2	—	0.2	0.1	0.4	negl.
Uruguay	—	0.1	0.1	1.6	5.4	4.5	5.2	—	negl.	0.1	2.0	7.7	7.4	8.1
Total[1]	2.0	5.3	6.8	13.3	18.0	12.8	11.1	1.1	3.6	6.9	15.9	24.6	18.5	16.7

[1]Totals may not agree due to rounding. Source: U.S. Department of Commerce, Bureau of the Census.

A "Quality Assurance" Program for Japan's Fish

The Japanese Fishery Agency has begun an experimental operation to label frozen fish with "Quality Labels." The label will inform the consumer of the last day of sale of the product (or the freshness date), the packaging date of the product, the name and address of the processor, the name of the fish, the directions for defrosting, and, if possible, a simple recipe. By labeling frozen fish with such information, the Agency hopes to bring back consumers who have become unfamiliar with fish products. The information is also aimed at helping young housewives who may not know how to determine the freshness of the fish or how to cook it.

The Agency will also monitor the distribution system to insure low-temperature storage of the fish, from the landing of the fish to the store. The Agency would also like to establish a uniform quality control system through this experimental operation.

During 1982, 2,000 metric tons of fish, including species of mackerel and pike, were labeled. The fish did not pass through central markets but were distributed directly from fishery cooperatives in the area where the fish were caught to designated retail stores in the cities. Half of the cost (US$500,000) needed to inspect and label the fish will be paid by the Japanese Government. The Agency reportedly wishes to extend the labeling to refrigerated fish if the labeling receives support from the consumer.

Fishery Officials of Africa and the Middle East

The Division of Foreign Fisheries Analysis, Office of International Fisheries Affairs, NMFS, NOAA, has prepared the following list of African and Middle Eastern fishery officials. The list is accurate as of July 1982. Information for the Canary Islands, Chad, Comoro Islands, Iran, Iraq, Lebanon, Libya, Namibia, Reunion, Transkei, and Zaire is unknown.

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Japan's Marine Culture Production, 1969-80

The culture of jack mackerel, sea bream, scallop, yellowtail, and oyster in Japan has grown by 190,240 metric tons (t) or 68 percent from 278,180 metric tons (t) to 468,420 t between 1969 and 1980. In 1980, oyster culture remained greatest at 261,323 t vs. 149,449 t for the second-ranked species, yellowtail (Table 1). Total production for the five marine species for the year was 468,420 t; the total for the 12-year period was 4,337,450 t.

Cultured scallops, with a 40,403 t harvest in 1980, were down 42,810 t from the highest production year, 1977, when 83,213 t were harvested. Production of sea bream and jack mackerel have grown from zero in 1969 to 14,973 t and 2,272 t, respectively, in 1980. (Source: FFIR 82-3.)

Table 1.—Japanese marine culture production of selected species, 1969-80.

Year	Production (in metric tons)					
	Jack mackerel	Sea bream	Scallop	Yellowtail	Oyster[1]	Total
1969	—	—	—	32,722	245,458	278,180
1970	7	454	5,674	43,354	190,799	240,288
1971	57	930	10,361	61,855	193,846	267,049
1972	127	1,380	23,049	77,059	217,373	318,988
1973	378	2,741	39,297	80,439	229,899	352,754
1974	619	3,298	62,651	92,946	210,583	370,097
1975	920	4,462	70,313	92,407	201,173	369,275
1976	704	6,572	64,946	101,786	226,278	400,286
1977	743	8,245	83,213	115,098	212,779	420,078
1978	809	11,315	67,750	121,956	232,068	433,898
1979	1,461	12,492	43,622	155,053	205,509	418,137
1980	2,272	14,973	40,403	149,449	261,323	468,420
Total	8,097	66,862	511,279	1,124,124	2,627,088	4,337,450

[1]With shell.

Ladders Could Aid Anadromous Species in New York, Virginia

New and proposed fish ladders in New York and Virginia hold hope of improving runs of salmon and of shad, striped bass, and river herring, respectively, state officials predict.

New York Environmental Conservation Commissioner Robert F. Flacke, in dedicating the new Willsboro Fishway at the Willsboro Dam on the Bouquet River, stated that it is "providing upstream passage for spawning salmon for the first time since the early 1800's." Between 1 and 26 October 1982, more than 100 Lake Champlain salmon—some approaching 8 pounds—were observed passing upstream.

The new facility establishes an additional opportunity for salmon fishing in 40 miles of the Bouquet River and its major tributary, the North Branch. Salmon also now have access to excellent spawning habitat in the North Branch where cool, clear water and a clean gravel bottom should result in abundant natural reproduction.

An upstream trap in the fishway allows biologists to monitor spawning runs, to evaluate stocking programs, to assess the contribution of natural reproduction, and to improve the DEC's salmon management program. A lighted viewing window provides a close view of salmon as they make their way up the "steps" of the fishway.

Above the fishway, DEC personnel have purchased fishing rights easements along key sections of the Bouquet and the North Branch to guarantee angling access to some of the most productive fishing areas.

The Department estimates that the new Bouquet River fishery will eventually attract more than 10,000 angler-trips each year, generating an expenditure in the local area of more than $194,000.

In Virginia, shad, river herring and striped bass stocks may be boosted by a research project at the Virginia Institute of Marine Science (VIMS).

VIMS scientist Joseph Loesch has begun a feasibility study of installing fish ladders to pass these fishes through the James River dams at Richmond. "These species lost their last access to ancestral spawning grounds of the James around 1890 when the Kanawha Canal gates at Richmond were closed," Loesch said.

Such fish passage facilities have succeeded elsewhere, the VIMS scientist noted, pointing out that Atlantic salmon, American shad, river herring, and striped bass, pass over the Connecticut River's Holyoke Dam by a fish lift, then continue through a fish ladder to Vernon, N.H. Shad runs, absent for 100 years, have been restored to the Pawcatuck River, R.I., after installation of a fish ladder, and fish ladders for American shad and Pacific salmon in the Pacific Northwest's Columbia River are well-known success stories.

All anadromous stocks have declined in the last century, according to Loesch. "Some have exhibited dramatic decreases within the last decade," he said, citing striped bass, shad, sturgeon, and herring.

Loesch expects several benefits to follow installation of fish ladders in the James River: 1) Increased spawning and nursery grounds; 2) More young forage fishes (river herring) for important predator species; 3) Enhancement of sport fisheries and supporting businesses; and 4) Increased commercial fishing downriver from Richmond.

The Virginia General Assembly passed legislation last February directing the Virginia Commission of Game and Inland Fisheries, in coordination with VIMS and the Virginia Marine Resources Commission, to study the need for fish passage facilities through low profile dams in the James River at Richmond.

Subsequently, the James River Fish Passage Facilities Committee was formed of members of those organizations, together with representatives of the National Marine Fisheries Service and the U.S. Fish and Wildlife Service. This committee defined the tasks to be addressed by Loesch.

Alaskan Abalone Harvests Increase

The average annual commercial harvest of abalone in southeastern Alaska has increased dramatically since 1977, according to the Alaska Department of Fish and Game. From 1963 through 1977, the average harvest was only 4,000 pounds. In 1978, the harvest leaped to 181,000 pounds, then took another big jump in 1979 to 357,000 pounds.

Although the harvest decreased slightly in 1980 to 250,000 pounds, its value to fishermen was estimated at $3 per pound, for an estimated worth of close to $1 million. Abalone is also an important noncommercial resource for it is collected at extreme low tides by an increasing number of recreational divers. Noncommercial harvests are regulated by size and bag limit restrictions.

Pacific Halibut Catch Nears 28 Million Pounds

The 1982 fishery for Pacific halibut, *Hippoglossus stenolepis,* ended on 16 September with the closure of Area 2B (all waters off the coast of British Columbia), with preliminary figures showing the catch during the

fifth and final fishing period in Area 2B was 550,000 pounds. Total catch for the area was 5.2 million pounds, slightly below the 5.4 million pound catch limit. The commercial fishery for halibut will now remain closed until reopened in 1983.

The total halibut catch for the 1982 season, again based on preliminary figures compiled by the International Pacific Halibut Commission (IPHC), was 27.8 million pounds, slightly above the 27.5 million pound catch limit. A recap of the catch limits and the catch for the six regulatory areas is given in Table 1.

Table 1.—Catch of Pacific Halibut for 1982 (preliminary data).

Regulatory area	Catch limit (Million pounds)	Total catch (Million pounds)
2A	0.2	0.2
2B	5.4	5.2
2C	3.4	3.4
3A	14.0	13.2
3B	3.0	4.4
4	1.5	1.4
Total	27.5	27.8

Source: IPHC

The IPHC, which is responsible for the management of Pacific halibut, had earlier recommended catch limits for 1982 totaling 27.5 million pounds —2.5 million pounds more than in 1981—to the Governments of Canada and the United States. The Commission's scientific staff presented stock assessment information indicating that halibut stocks were rebuilding, particularly in the Gulf of Alaska. The staff also reported that the abundance of young fish is increasing, an encouraging sign for the future. The Commission continued to express concern that the incidental catch of halibut in fisheries targeting on other species was also increasing, partially due to the greater halibut abundance.

Marine Angling: Worth $5 Billion in Florida

Florida saltwater recreational fishing during a 12-month period in 1980-81 generated $5 billion in business and accounting, directly or indirectly, for employing 124,000 people, according to a recent Florida economic study.

The investigators, Frederick W. Bell, Philip E. Sorenson, and Robert Leeworthy, Florida State University, Tallahassee, found that more than 2 million residents and 3 million tourists ⩾18 years of age participated in marine angling during the 12-month period. Residents spent about $1.1 billion on nondurable goods (i.e., fuel, boat maintenance, etc.) and tourists spent $760 million. This resulted in a direct impact of $1.86 billion on the Florida economy with 44,108 retail employees in the state depending on these expenditures for their livelihood.

In addition, the study showed that tourist dollars spent on recreational saltwater fishing created a multiplier effect of an estimated $3.18 billion which indirectly stimulated employment for nearly another 80,000 people.

Copies of the full report, "The economic impact and valuation of saltwater recreational fisheries in Florida," SGF-47, are available from the Sea Grant Marine Advisory Program, G022 McCarty Hall, University of Florida, Gainesville, FL 32611 for $3 per copy.

Alaska Rears, Releases Record Numbers of Salmon

An estimated 178.4 million young Pacific salmon, *Oncorhynchus* spp., were released from Alaska Department of Fish and Game (DFG) hatcheries during 1982, nearly 50 million more than in 1981, and a new record high, the Department reports. Stanley A. Moberly, Director of the DFG's Division of Fisheries Rehabilitation, Enhancement and Development, said the releases included 106 million pink salmon, *O. gorbuscha*; 40 million chum salmon, *O. kata;* 28 million sockeye salmon, *O. nerka;* and more than 3 million king, *O. tshawytscha;* and coho, *O. kisutch,* salmon.

Releases of pink salmon at the Kitoi Bay Hatchery on Afognak Island and the Cannery Creek Hatchery in Prince William Sound were responsible for most of the production increase, Moberly said. Chum salmon production came largely from four hatcheries: Snettisham near Juneau, Hidden Falls near Sitka, Beaver Falls near Ketchikan, and Russell Creek near Cold Bay. The most successful sockeye producer was the Crooked Creek Hatchery near Soldotna, which released more than 17 million young fish. With the 1982 releases complete, Moberly said that State hatchery personnel were actively taking salmon eggs to provide fish for the 1983 releases.

Oregon Rockfish Landings Show Continued Growth

Landings of rockfish, *Sebastes* spp., in Oregon increased again in 1981 to about 50.9 million pounds, a considerable increase over previous years (Table 1.)

Table 1.—Oregon rockfish landings, 1972-81.

Year	Pounds	Year	Pounds
1972-76 (avg.)	4,220,000	1979	19,194,400
1977	4,731,100	1980	35,173,200
1978	11,559,800	1981	50,900,000

Of the 50.9 million pounds of rockfish landed in 1981, 32 million pounds were widow rockfish, a comparatively new fishery on the Oregon coast. Widow rockfish are filleted and used for food. During 1981 the ex-vessel price for widow rockfish ranged from $0.14-0.17 per pound, with most being at $0.14 per pound. To produce a superior quality of widow rockfish, some fishermen are bleeding the fish at sea and are receiving an ex-vessel price of $0.20 per pound. Toward the latter part of 1981 there was a scarcity of widow rockfish on the Oregon coast. It is not clear why, but possibly extremely poor weather conditions caused the relocation of the widow rockfish and they have not been found yet. Also, there was some speculation that the resource may be dwindling.

Technical Memoranda From the Northeast Fisheries Center

In addition to its formal scientific publications, the National Marine Fisheries Service uses the NOAA Technical Memorandum series for informal publication of specialized reports that require multiple copies, but when complete formal review and editorial processing are not appropriate or feasible. However, documents in this series reflect sound professional work and are referenced in formal journals.

This month, the first 12 Technical Memoranda produced by the NMFS Northeast Fisheries Center, Woods Hole, Mass., are listed. Copies may be ordered by number from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161.

"Overview Document of the Northeast Fishery Management Task Force, Phase I," by Richard C. Hennemuth, Brian J. Rothschild, Lee G. Anderson, and William A. Lund, Jr. U.S. Dep. Commer., NOAA Tech. Memo NMFS-F/NEC-1, 12 p., 1980.

"History and Status of the Atlantic Demersal Finfish Fishery Management Plan," by Guy D. Marchesseault, Richard P. Ruais, and Der-Hsiung Wang. U.S. Dep. Commer., NOAA Tech. Memo NMFS-F/NEC-2, 8 p., 1980.

"Definition of Management Units," by Emory D. Anderson and Guy D. Marchesseault. U.S. Dep. Commer., NOAA Tech. Memo NMFS-F/NEC-3, 4 p., 1980.

"Fishery Management Techniques, A Review," by Michael P. Sissenwine and James E. Kirkley. U.S. Dep. Commer., NOAA Tech. Memo NMFS-F/NEC-4, 10 p., 1980.

"The Status of the Marine Fishery Resources of the Northeastern United States," by Margaret M. McBride and Bradford E. Brown. U.S. Dep. Commer. NOAA Tech. Memo NMFS-F/NEC-5, 13 p., 1980.

"Economic and Biological Data Needs for Fisheries Management, With Particular Reference to the New England and Mid-Atlantic Areas," by Guy D. Marchesseault, Joseph J. Mueller, and Ivar E. Strand, Jr. U.S. Dep. Commer., NOAA Tech. Memo NMFS-F/NEC-6, 13 p., 1980.

"Methodology for Identification and Analysis of Fishery Management Options," by Brian J. Rothschild, Richard C. Hennemuth, Jacob J. Dykstra, Leo C. Murphy, Jr., John C. Bryson, and James D. Ackert. U.S. Dep. Commer., NOAA Tech. Memo NMFS-F/NEC-7, 10 p., 1980.

"Phytoplankton Community Structure in Northeastern Coastal Waters of the United States. I. October 1978," by Harold G. Marshall and Myra S. Cohn. U.S. Dep. Commer., NOAA Tech. Memo NMFS-F/NEC-8, 14 p., 1981.

"Phytoplankton Community Structure in Northeastern Coastal Waters of the United States. II. November 1978," by Harold G. Marshall and Myra S. Cohn. U.S. Dep. Commer., NOAA Tech. Memo NMFS-F/NEC-9, 14 p., 1981.

"Annual NEMP Report on the Health of the Northeast Coastal Waters of the United States, 1980," Northeast Monitoring Program Report No. NEMP IV 81 A-H 0043. U.S. Dep. Commer., NOAA Tech. Memo NMFS-F/NEC-10, 79 p., 1981.

"Proceedings of the Summer Flounder *(Paralichthys dentatus)* Age and Growth Workshop, 20-21 May 1980, Northeast Fisheries Center, Woods Hole, Massachusetts," by Ronald W. Smith, Louise M. Dery, Paul G. Scarlett, and Ambrose Jearld, Jr. U.S. Dep. Commer., NOAA Tech. Memo NMFS-F/NEC-11, 14 p., 1981.

"Status of the Fishery Resources off the Northeastern United States for 1981." U.S. Dep. Commer., NOAA Tech. Memo NMFS-F/NEC-12, 1982.

Sciaenids and Marine Recreational Fisheries

"Marine Recreational Fisheries 6," the proceedings of the sixth annual Marine Recreational Fisheries Symposium, is devoted to the sciaenids, a territorial sea demersal resource. Edited by Henry Clepper, the volume was published by the Sport Fishing Institute (SFI) for the International Game Fish Association, the National Coalition for Marine Conservation, and the SFI.

The symposium steering committee developed five panels: 1) An overview of sciaenid fishery resources, chaired by Robert Kemp; 2) social and economic aspects of sciaenid fisheries, chaired by Biliana Cicin-Sain; 3) biology of sciaenids, chaired by James E. Weaver; 4) existing institutions and management, chaired by H. A. Rhodes; and 5) restoration, perpetuation, and resource monitoring, chaired by John V. Merriner.

Introductory talks featured a brief look at problems in securing State fisheries legislation by Texas State Senator John Wilson. William Gordon, now NOAA Assistant Administrator for Fisheries, outlined the importance and prospects for marine recreational fisheries. The future for MRF is bright, he notes, "so long as we can maintain and conserve our valuable fisheries resources, provide opportunities for our fishermen to pursue their sport, and encourage activities which will strengthen the marine recreational fishing industry."

Panel 1 presented good reviews of sciaenid resources in the Atlantic and Pacific Oceans and the Gulf of Mexico, by Stuart J. Wilk, Robson A. Collins, and Eugene L. Nakamura, respectively. For Panel 2, James C. Cato reviewed the economic values and uses of sciaenid fisheries; Alan R.

Graefe examined ways of understanding diversity among recreational marine anglers, especially identifying and describing characteristics and motivations of those who fish for sciaenids; and John Maiolo discussed user conflicts and competition in fisheries management.

In the third session, Howard Powles reviewed eggs and larvae of North American sciaenids, suggesting more research on taxonomy and early life history. David L. Thomas reviewed the comparative ecology of drums from the Delaware River estuary and Michael P. Weinstein reviewed the biology of important adult sciaenids of the Atlantic and Gulf coasts, citing a need to clearly identify major genetic stocks and their movement patterns, improve the predicting of year-class success and yield, and better learn the effects of habitat degradation, overfishing, competition and predation, etc., on the species.

In Panel 4, William S. Perret discussed sciaenid management in the northern Gulf of Mexico, Eugene V. Toffoli reviewed management in the Pacific coast states, and Terrance R. Leary related the role of Fishery Management Councils in fisheries management, commenting especially on the Gulf of Mexico Fishery Management Council's work on a groundfish management plan.

In Panel 5, on restoring and perpetuating the resource, Donald E. Wohlschlag provided an overview of natural factors affecting sciaenid recruitment and Robert J. Livingston reported on his studies of human impacts on the distribution and abundance of sciaenids in the northeastern Gulf of Mexico. The possibilities of using artificially propagated sciaenids as a management tool was explored by Walter M. Tatum.

This popular series of symposia, and publications, has been successful in focusing attention on the marine recreational fisheries and its needs, although the thrust has changed somewhat. The original volume, entitled simply **"Marine Recreational Fisheries,"** set the course by exploring the basic nature of marine recreational fisheries from economic, sociological, biological, and managerial points of view.

It included an economic evaluation of marine angling and a look at the economic implications of the allocation of fishery resources between various user groups, based on the Columbia River salmon-steelhead fishery. Likewise, sociocultural values of marine angling, and social aspects in the allocation of marine recreational resources were defined and explored.

Environmental quality programs and marine productivity were discussed, fishery stock assessment programs were reviewed, and differences in management of marine recreational fisheries were aired. Finally, the role of Federal and State governments and nongovernmental organizations in managing and protecting marine resources and angling was reviewed.

Collectively, the series represents an important contribution to the biology, economics, sociology, and management of marine recreational fisheries. Clothbound, all six editions of "Marine Recreational Fisheries" are available from the International Game Fish Association, 3000 East Las Olas Boulevard, Fort Lauderdale, FL 33316 for $15 each or $50 for the entire set.

The Marine Environment Near Shore: A Symposium

"The Shore Environment," edited by J. H. Price, D. E. G. Irvine, and W. F. Farnham, has been published in two volumes (Volume 1: Methods; Volume 2: Ecosystems) by Academic Press Inc. (London) Ltd., 24-28 Oval Road, London, England NW1 7DX, for the Systematics Association. The set constitutes the Proceedings of an International Symposium held at the Portsmouth Polytechnic, and are Systematics Association Special Volume No. 17a and b respectively.

In these volumes, "shore environment" refers to the supratidal (within the sphere of marine influence), intertidal, and adjacent subtidal levels. Volume 1 begins with a personal view on the objectives and phases in littoral ecology by J. R. Lewis, examines critically the pressures to publish rapidly shorter papers and how this affects ecological studies, and identifies several fertile fields of study. W. Eifion Jones relates in chapter 2 the methods used in the field courses in shore ecology from basic needs through organism identification, shore description, recording the biota, and other parameters. Photography, often neglected by scientists, is well-covered as a research tool in Chapter 3 by J. David George. Photo equipment is described as are the many uses it has for the scientists. Such problems as underwater lighting, infrared and ultraviolet light photography, television and remote control photography, and special techniques are covered.

Other chapters (and authors) include biological monitoring and exposure scales (D. H. Dalby), methods of data collection and processing in rocky intertidal monitoring (W. E. Jones et al.), applications of simple numerical methods to the analysis of intertidal vegetation (G. Russell), the permanent quadrat method (P. J. G. Polderman), marine flora of chalk cliffs (Ian Tittley and Kathleen M. Shaw), remote sensing and field sampling of mudflat organisms (M. G. Coulson et al.), data collection and analysis strategies of subtidal vegetation (D. M. John et al.), a computer-based system for habitat and species data (R. C. Earll), and the survey and nature conservation assessment of littoral areas (S. J. T. Knight). Each chapter contains an abstract and list of references.

Volume 2, Ecosystems, presents a chapter on the description and classification of sublittoral epibenthic ecosystems as a basis for the selection and assessment of key marine conservation areas in Britain by Keith Hiscock and Roger Mitchell. Photophilic infralittoral algal vegetation of western Mediterranean rocky surfaces is described by E. Coppejans. Other chapters (and authors) include marine phytobenthos studies in Newfoundland (Robert G. Hooper et al.), a review of estuarine benthic algae and their environment (Martin Wilkinson), niche and community in the inshore benthos (J. H. Price), Southern California rocky intertidal ecosystems (Mark M. Littler), changes in intertidal ecosystems after reclamation work (J. J. P. Clokie and A. D.

work (J. J. P. Clokie and A. D. Boney), relationships of fish and algae in temperate waters (Alwyne Wheeler), predation and community structure (Roger N. Hughes), free-living nematodes and the littoral ecosystem (H. M. Platt and R. M. Warwick), invertebrate epiphytes of coastal marine algae (P. J. Hayward), British rocky-shore lichens (A. Fletcher), algal communities of floating structures in southern England (R. L. Fletcher), alien marine flora of southern England (W. F. Farnham), and daylength and temperature effects on algal life history (K. Luning).

Volume 2 also contains interesting reviews on predator-prey relationships and community structure by Roger N. Hughes and a discussion of the relationships of fish and algae in temperate waters by Alwyne Wheeler. Another lengthy chapter by J. J. P. Clokie and A. D. Boney outlines the changes to intertidal ecosystems in the Firth of Clyde following an iron-ore terminal, including a jetty and filling area.

Both volumes present taxonomic and subject indexes, a list of contributors and symposium participants, and a list of Systematics Association publications. They are available from the publisher for £24.80 ($57.50) for Volume 1 and £48.20 ($111.00) for Volume 2.

Squid Resources, Their Harvest, and Marketing

The **"Proceedings of the International Squid Symposium"** held 9-12 August 1981 in Boston, Mass., and prepared by the New England Fisheries Development Foundation, Inc., has been published by Unipub, P.O. Box 433, Murray Hill Station, New York, NY 10016.

The symposium brought together nearly 200 squid experts and industry representatives from all over the world to discuss all aspects of the utilization of squid resources. Voluminous (at 390 pages) and detailed, the wide-ranging volume contains 27 papers along with the transcripts of discussions on many aspects of squid harvesting, handling, processing, and marketing. Both the papers and discussions printed will be of considerable interest and value.

The opening session provided a brief review of the U.S. interest in squid fisheries by Allen E. Petersen, Director, NMFS Northeast Regional Office, and a look at New Zealand's experiences in developing squid fisheries by N. E. Jarman, general manager of the New Zealand Fishing Industry Board. A perspective on the Spanish squid market—second only to the Japanese market—was given by James Milnes, and a panel discussion on squid processing developments was presented by Robert Learson, NMFS Gloucester Laboratory; Rodger Crossman of New Zealand; and Norman Haard of Newfoundland's Memorial University in St. John's.

The second session, "Harvesting Experience," provides a look at the jumbo squid fishery in Mexico's Gulf of California, Canadian squid harvesting, fishing squid off Uruguay and off Cape Anne, Mass., and a discussion of joint venture squid operations. Two Polish scientists relate their observations on the squid behavior during jigging, and spatial patterns in a mixed fishery for *Loligo brasiliensis* and *L. pleii* off southern Brazil are discussed by Marcelo Juanico. Light attraction techniques in squid fishing are reviewed by Efren Ed. C. Flores and Duncan Amos and Robert DeMello described the application of multifrequency echo sounders to squid detection.

The third session presented reviews of squid handling, processing, and new product development in Spain, southern Europe, Poland, New Zealand, Canada, and South America. Other articles included an overview of the U.S. Pacific coast squid fishery, textural evaluation of *Illex illecebrosus* as affected by cook time, the status of squid processing and preservation technology in the northeastern United States, and the outlook for squid processing and marketing in Uruguay. A fourth session, "International Market Outlook for Squid," provided reviews of squid marketing in Japan and southern Europe, plus the successful introduction of a new squid product made from *Dosidicus gigas* caught off Mexico.

Finally, roundtable discussions on harvesting, processing, and the marketing outlook provide more detailed discussion of fishing gear, techniques (value of colored or white lights, differing colors of jigs, angle of lights, use of trawls, traps, and gill nets), etc. Paperbound in large-format (8½ × 11″), the volume is available from the publisher for $33.50 plus shipping and handling charges.

More of a how-to-do-it manual is **"Squid Jigging From Small Boats."** Authors are Mototsuga Hamabe, Chikamasa Homuro, and Michio Ogura—Japanese squid experts—and the book was edited by the FAO Fisheries Technology Service and published by Fishing News Books Ltd., 1 Long Garden Walk, Farnham, Surrey, England.

Beginning with a brief look at the history of squid jigging in Japan, the authors review the general characteristics of squids and describe the primary commercial species, present world production, and development potentials.

The bulk of the book, pages 12-56, consists of well-illustrated descriptions of modern small-boat squid jigging techniques and gear. Included are the use of echo sounders for location of squids and attracting them with artificial lights (lamp arrangement, lighting efficiency and intensity, bulb characteristics, underwater lamps, etc.). Squid jigging gears and the reaction of squid to jigs and lines are also covered, as are various types of automatic and hand-operated jigging reels. Types of vessels and fishing operations are also outlined, and another section relates handling and storage of the catch. Finally, the authors provide guidelines for the development of a new squid jigging fishery.

Squid jigging, one of Japan's oldest coastal fisheries, can often be started with minor modification to existing vessels. It may require relatively little capital investment and is adaptable to local conditions. This book provides sound, basic guidance for anyone interested in this type of fishery. Paperbound, the small (6 × 9″) 74-page volume costs £6 plus 60 p postage and is available from the publisher.

Marine Anglers, Angling Records, and Fish Poachers

. . . . **A record year for angling records was predicted for 1982** by the International Game Fish Association (IGFA) of Ft. Lauderdale, Fla. The organization anticipated awarding well over 500 new world records for rod-and-reel caught fish. In 1981 the Association granted 302 world records out of 410 applications. But as of 30 September 1982, 386 world records had already been granted, with 241 in saltwater line class categories, 21 for saltwater fly fishing, and 124 for freshwater fishes. Despite the unprecedented number of 1982 angling records, the IGFA reports 1,350 vacancies for records—821 for saltwater anglers alone, partly owing to the addition of new light-tackle line and tippet classes added in the saltwater record-keeping program last year . . . .

. . . . A white marlin, tagged off Ocean City, Md., 26 Sept. 1970 and **at liberty for almost 12 years, was recaptured on 10 July 1982** about 40 miles south of Block Island, N.Y., reports the NMFS Atlantic Cooperative Game Fish Tagging Program. When recaught, the marlin was reported in "shabby" condition, weighing 65 pounds and measuring 71 inches (fork length). It was a new time-at-liberty record for a tagged billfish. Meanwhile, Australian scientists reported a new distance record for a tagged black marlin of 2,356 miles. The fish had been tagged at Dunk Island, Queensland, in September 1980 and was recaptured off the Republic of Kiribati (formerly the Gilbert Islands) in April 1982 . . . .

. . . . **The 1983 Symposium on Buoy Technology,** announced jointly by the NOAA Data Buoy Office and the Gulf Coast Section of the Marine Technology Society, is scheduled for 27-29 April in New Orleans, La. The symposium will have technical programs on moored and drifting buoys. Possible topics will include: Hulls, sensors, instrumentation, data collection/reporting systems, buoy environment, moorings, power systems, mathematical modeling, etc. For further information, contact the NOAA Data Buoy Office, National Space Technology Laboratories, NSTL Station, MS 39529 . . . .

. . . . **California's fish and game wardens hit San Francisco Bay area striped bass poachers hard** last summer with the arrest of 24 suspects and seizure of 20 gill nets (one more than a mile long) made from monofilament nylon fishing line. The suspects, mostly recent immigrants from Southeast Asia, had taken 202 stripers totaling 2,000 pounds and about 500 pounds of other species. Buyers of the stolen fish at two local markets were also arrested. State officials, estimating that they have been able to catch only 2 percent of the fish thieves, believe that the poachers actually got away with 10,000 fish . . . .

. . . . **Seven new acres of oyster shell planted in Texas'** lower San Antonio Bay last spring achieved a spat set in July despite low salinities and are expected by produce marketable oysters in time for the 1983 oystering season, the Texas Parks and Wildlife Department reports. Slightly more than 400 spat and small oysters per square foot were observed, biologists reported. An additional 12 acres were sowed with shell in the Bay later in the year . . . .

. . . . **Formalin, a dilute formaldehyde solution, is the 34th compound** to be made available to fish culturists for disease control, the U.S. Fish and Wildlife Service reports. After 9 years of research, the Food and Drug Administration has been satisfied that the compound can be used without harm to fish, consumers, or the environment, in the control of external parasites and fungal infections. Qualified companies wishing to market the product for fishery use must file a New Animal Drug Application (NADA) with the FDA, but will not be required to do any further research or testing owing to the FWS master file now on record at the FDA . . . .

. . . . **Texas' coastal anglers harvested about 2.5 million fish** during the 1-year period between 15 May 1981 and 15 May 1982, the Texas Parks and Wildlife Department reports. About half of the fish taken were spotted seatrout, often called "speckled trout" by coastal anglers. The fishermen had to spend about 4.5 million man-hours to catch the fish, averaging about 0.5 fish per hour . . . .

. . . . University of Rhode Island **scientists report as much as a 50 percent increase in the shelf life of fresh fish** by dipping it in a solution of glucose oxidase or keeping the fish on ice to which the enzyme has been added. The fish also reportedly retains moisture longer, too. Long used in such products as fruit juice, the enzyme was tested with minced fish and both whole and filleted winter flounder. Experiments are continuing to determine the concentrations needed in a dip or ice mixture since use of the enzyme could add 4-5 cents per pound to the cost of a fish . . . .

Erratum

In the article "Artificial Reefs: Toward a New Era in Fisheries Enhancement?" by Richard B. Stone in the June-July 1982 issue of the *Marine Fisheries Review,* 44(6-7):2, the second sentence of paragraph one should read: "Early reef construction in the United States dates back to the mid-1800's (Stone, 1974)."

Editorial Guidelines for *Marine Fisheries Review*

Marine Fisheries Review publishes review articles, original research reports, significant progress reports, technical notes, and news articles on fisheries science, engineering, and economics, commercial and recreational fisheries, marine mammal studies, aquaculture, and U.S. and foreign fisheries developments. Emphasis, however, is on in-depth review articles and practical or applied aspects of marine fisheries rather than pure research.

Preferred paper length ranges from 4 to 12 printed pages (about 10-40 manuscript pages), although shorter and longer papers are sometimes accepted. Papers are normally printed within 4-6 months of acceptance. Publication is hastened when manuscripts conform to the following recommended guidelines.

The Manuscript

Submission of a manuscript to *Marine Fisheries Review* implies that the manuscript is the author's own work, has not been submitted for publication elsewhere, and is ready for publication as submitted. Commerce Department personnel should submit papers under completed NOAA Form 25-700.

Manuscripts must be typed (double-spaced) on high-quality white bond paper and submitted with two duplicate (but not carbon) copies. The complete manuscript normally includes a title page, a short abstract (if needed), text, literature citations, tables, figure legends, footnotes, and the figures. The title page should carry the title and the name, department, institution or other affiliation, and complete address (plus current address if different) of the author(s). Manuscript pages should be numbered and have 1½-inch margins on all sides. Running heads are not used. An "Acknowledgments" section, if needed, may be placed at the end of the text. Use of appendices is discouraged.

Abstract and Headings

Keep titles, heading, subheadings, and the abstract short and clear. Abstracts should be short (one-half page or less) and double-spaced. Paper titles should be no longer than 60 characters; a four- to five-word (40 to 45 characters) title is ideal. Use heads sparingly, if at all. Heads should contain only 2-5 words; do not stack heads of different sizes.

Style

In style, *Marine Fisheries Review* follows the "U.S. Government Printing Office Style Manual." Fish names follow the American Fisheries Society's Special Publication No. 6, "A List of Common and Scientific Names of Fishes from the United States and Canada," third edition, 1970. The "Merriam-Webster Third New International Dictionary" is used as the authority for correct spelling and word division. Only journal titles and scientific names (genera and species) should be italicized (underscored). Dates should be written as 3 November 1976. In text, literature is cited as Lynn and Reid (1968) or as (Lynn and Reid, 1968). Common abbreviations and symbols such as mm, m, g, ml, mg, and °C (without periods) may be used with numerals. Measurements are preferred in metric units; other equivalent units (i.e., fathoms, °F) may also be listed in parentheses.

Tables and Footnotes

Tables and footnotes should be typed separately and double-spaced. Tables should be numbered and referenced in text. Table headings and format should be consistent; do not use vertical rules.

Literature Citations

Title the list of references "Literature Citations" and include only published works or those actually in press. Citations must contain the complete title of the work, inclusive pagination, full journal title, the year and month and volume and issue numbers of the publication. Unpublished reports or manuscripts and personal communications must be footnoted. Include the title, author, pagination of the manuscript or report, and the address where it is on file. For personal communications, list the name, affiliation, and address of the communicator.

Citations should be double-spaced and listed alphabetically by the senior author's surname and initials. Co-authors should be listed by initials and surname. Where two or more citations have the same author(s), list them chronologically; where both author and year match on two or more, use lowercase alphabet to distinguish them (1969a, 1969b, 1969c, etc.).

Authors must double-check all literature cited; they alone are responsible for its accuracy.

Figures

All figures should be clearly identified with the author's name and figure number, if used. Figure legends should be brief and a copy may be taped to the back of the figure. Figures may or may not be numbered. Do not write on the back of photographs. Photographs should be black and white, 8- × 10- inches, sharply focused glossies of strong contrast. Potential cover photos are welcome but their return cannot be guaranteed. Magnification listed for photomicrographs must match the figure submitted (a scale bar may be preferred).

Line art should be drawn with black India ink on white paper. Design, symbols, and lettering should be neat, legible, and simple. Avoid freehand lettering and heavy lettering and shading that could fill in when the figure is reduced. Consider column and page sizes when designing figures.

Finally

First-rate, professional papers are neat, accurate, and complete. Authors should proofread the manuscript for typographical errors and double-check its contents and appearance before submission. Mail the manuscript flat, first-class mail, to: Editor, *Marine Fisheries Review*, Scientific Publications Office, National Marine Fisheries Service, NOAA, 7600 Sand Point Way N.E., BIN C15700, Seattle, WA 98115.

The senior author will receive 50 reprints (no cover) of his paper free of charge and 100 free copies are supplied to his organization. Cost estimates for additional reprints can be supplied upon request.

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